

The Virtual Magnetospheric Observatory (VMO)

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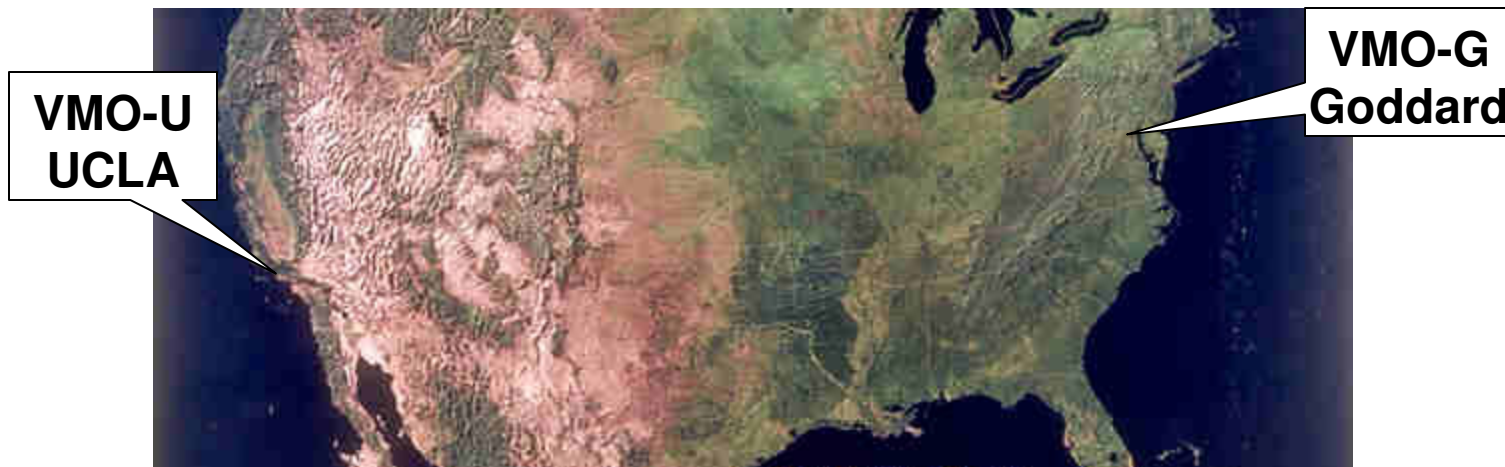
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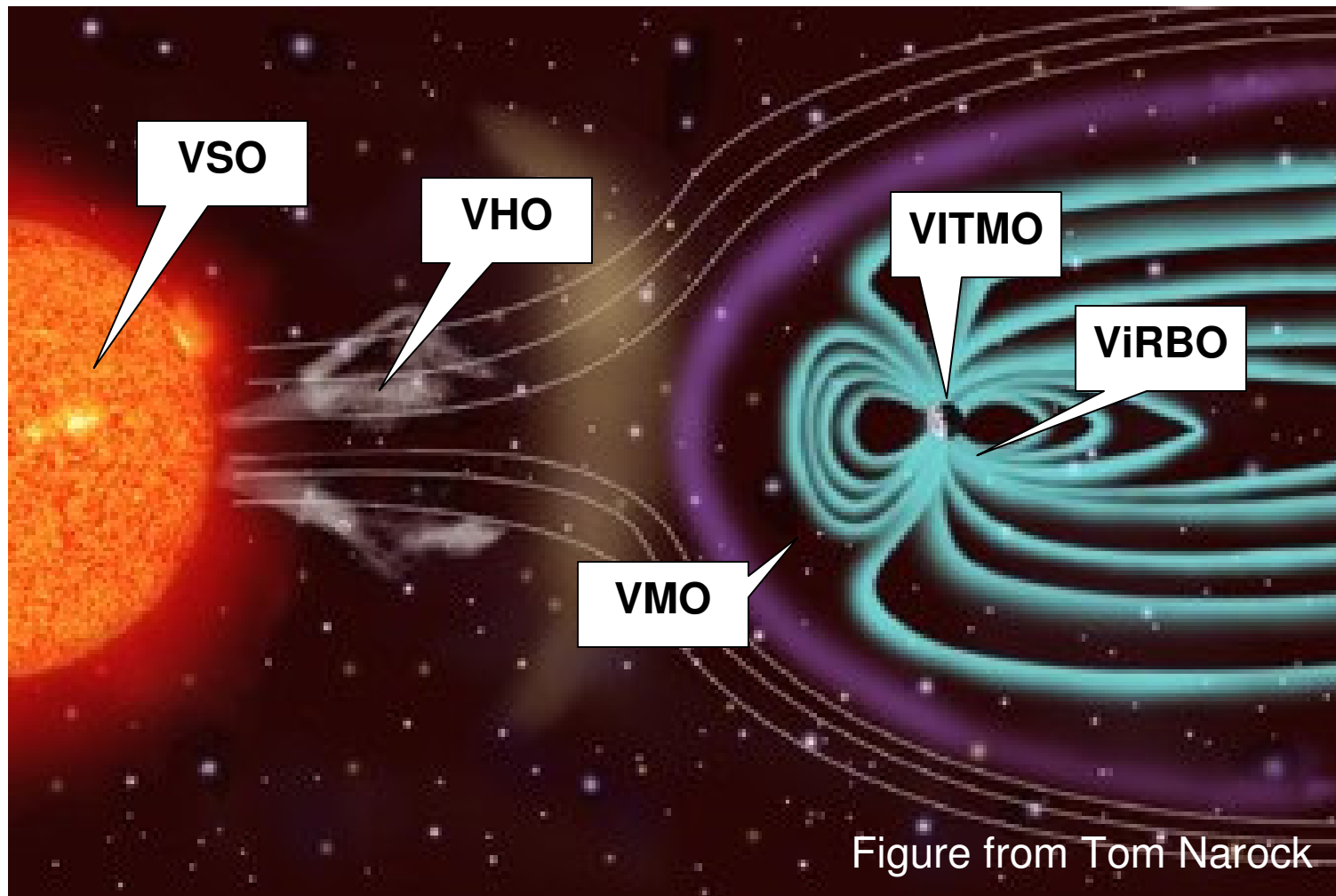
The Virtual Magnetospheric Observatory - VMO

- The Virtual Magnetospheric Observatory (VMO), part of NASA's virtual observatory effort for Heliophysics research, is unique.
- The VMO is lead by two groups one at Goddard and the other at UCLA.
- Each group operates as peer virtual observatories.
- Each virtual observatory functions as an access point to all the VMO resources and services.



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Where are we in NASA's Heliophysics VxO Universe



VMO Operations

Basic Concept

100% SPASE based

1. Resource Providers describe their resources using SPASE
2. Descriptions are harvested and served by a Registry Server.
3. Registry Servers can be chained in self-declared networks.
4. A search can enter the network at any point circulate the network.
5. Results from all sources are blended.

VMO Operations Coordination

- Each VMO describes or coordinates activities in their agreed upon communities.
- Each VMO is developing tools and components to build an extensible VxO.
- Pursuing a multi-tiered, multiple peer architecture.

The VMO is more...

- We have international collaborations
Some examples:
 - CANOPUS (Canadian Space Agency)
 - ULTIMA (International ground station consortium)
- Participation is open.
 - Registries here, there, everywhere
- Trusted partner network.
 - Self-declared networks
 - Distributed searches (more later)

How we Operate (UCLA)

- Train team of domain experts (X-Men) in SPASE, tools and procedures.
- Assign specific projects/missions to each X-Men
- Provide technical support to missions or groups establishing registry servers.

Qualifications of the Magnetospheric X-men

- Research scientists who are actively engaged in the analysis of magnetospheric data.
 - Must understand space plasma physics.
 - Must understand space particles and fields instruments or have sufficient background that they can quickly learn about them.
 - Must be expert in time series data analysis techniques.
- X-men must augment their scientific background with training in the principles of data management.
- Must understand the details of the SPASE data model.
- Must be expert in tools used for creating the metadata and populating the registries.

What X-men do

- Develop a plan to make all of the data useful for magnetospheric research available to the community.
 - We are working to make the list exhaustive.
 - The list includes correlative data which we plan to access through the other VxOs.
- Prioritized the ingestion tasks and work out an ingestion schedule.
- Contact data providers and jointly work out a plan to include their data in the VMO.

All in collaboration with our VMO peers.

Working with Data Providers to make Data Available Through VMO

The X-men assist the data providers to:

- Use a SPASE editor to write high level SPASE XML.
- Verify the XML.
- Create Rule Sets (or other software) to populate the detailed level SPASE XML.
- Establish the registry at the remote site, if desired.
- Load the high level SPASE XML into the registry.
- Run the Rule Sets (or other software) to populate the registry.

Most importantly an expert is available to data providers at each step of the process.

Technology at UCLA

We are exploring:

- Distributed, federated searches
- Harvesting techniques
- Word based (google-like) search interface
 - Relevance Scoring
 - Facets
- Multi-site presence
 - Two locations – one presentation

Technology at Goddard

We are exploring:

- Statistical value based searches (min, max, avg, standard deviation...)
- Spatial region and ephemeris based searches
- Techniques from the astronomical VO (VOTables, query language)
- User friendly view of SPASE metadata
- [VMO Metadata Example \(WIND MFI v4 Data\)](#)

What we need from SPASE

- Standard services
 - Registry harvesting
 - Distributed search
 - Resource streaming
 - Formats
 - Methods
- Metadata support (new Resource Types)
 - Document
 - Software
 - Simulations and Models