A Space and Solar Physics Data Model

from the SPASE Consortium

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1. Executive Summary

The Solar and Space Physics communities need a unified data environment to facilitate finding, retrieving, formatting, and obtaining basic information about data essential for their research. With the increasing requirement for data from multiple sources, this need has become acute. A unified method to describe data and other resources is the key to achieving this unified environment. The SPASE (Space Physics Archive Search and Extract) Data Model provides a basic set of terms and values organised in a simple and homogeneous way, to facilitate access to Solar and Space Physics resources. The SPASE Data Model is comparable to the data models developed by the Planetary Data System (PDS) and the International Virtual Observatory Alliance (IVOA) for planetary and astronomical data, respectively. The SPASE Model will provide the detailed information at the parameter level required for Solar and Space Physics applications.

The SPASE consortium is an international team of space and solar physicists and information scientists. It first examined many existing data models, but found none to be adequate. A set of terms based on a half-dozen or so of the most complete of such models was refined based on applying the model at various levels of detail to a large number of existing products to arrive at the current version. The major creators of SPASE-based product descriptions are expected to be domain-based Virtual Observatories ("VxOs"), data centers, and individual data and model providers. The SPASE Data Model will continue to evolve in a controlled way as data and service providers and benefiting researchers suggest improvements to extend its framework of common standards. Success of the model will be measured by the extent of community support and use.

The present Data Model provides enough detail to allow a scientist to understand the content of Data Products (e.g., a set of files for 3 second resolution Geotail magnetic field data for1992 to 2005), together with essential retrieval and contact information. A typical use would be to have a collection of descriptions stored in one or more related internet-based registries of products; these could be queried with specifically designed search engines which link users to the data they need. The Data Model also provides constructs for describing components of a data delivery system. This includes repositories, registries and services.

This document provides potential users of SPASE with the Data Model for review and use. Sections 2 and 3 provide an overview of the origins and the concepts of the data model. Section 4 presents the set of elements in a hierarchy that shows the natural relationships among them. This is followed by usage suggestion and pedagogic examples in Section 5 and 6, and by the complete set of definitions of terms and enumerated lists in Section 7.

2. Introduction

The Space and Solar Physics community is now addressing fundamental questions concerning the plasma and magnetic environment of the Sun, Heliosphere, and planets. We seek to understand everything from "microscopic" phenomena such as magnetic reconnection and turbulent energy dissipation to global issues such as how solar events are related to potentially damaging electric currents and energetic particles in the vicinity of the Earth. Multispacecraft and ground observatory investigations are becoming the norm, but there has been little corresponding unification of data access, formats and tools, resulting in a great deal of time being spent finding, retrieving and reformatting data. The key to reducing this inefficiency is a uniform way to describe adequately what exists. This is the purpose of the SPASE Data Model, which is intended to do for Space and Solar Physics what the Planetary Data System (PDS) is doing for Planetary Science, and what the International Virtual Observatory Alliance (IVOA) is doing for Astronomy and Astrophysics.

Astronomy, Planetary Science, and Space and Solar Physics have developed their data models with different objectives and constraints. Astronomy has objects defined by their direction, and makes much use of standard formats; PDS was developed for long-term archiving; while SPASE is oriented towards data searching and exploitation. PDS often does a better job of describing technical information such as how the data were processed, the form of the data etc., while SPASE includes a better physical description, which facilitates rapid data retrieval and exploitation. Over time, the Astronomy, PDS, and SPASE models may converge. The increasing use of, for example, time series in Astronomy and images in Space Physics may lead to stronger connections between the efforts in these areas. There will also be a need for SPASE to understand Earth Science data models, as Space Weather studies reveal the coupling of the larger plasma environment to terrestrial effects.

2.1. What is a data model?

A data model is a set of terms and their relationships that capture the essential concepts of a given domain. The Data Model presented here can be used to describe the scientific relevance of products resulting from observation and modeling in the domain of solar and space physics. These products typically consist of related collections of files that will be accessed, in whole or in part, by science users. Types of products include numerical datasets, display data plots, images, software, documentation, and event lists ("catalogs"). Products are a subset of a larger class of "Resources" that includes Spacecraft, Instruments, Repositories, and even People, that can be described by their own set of terms, and then referred to in product descriptions, rather than being repeatedly described in each product. This data model includes terms relevant to all "Sun-Earth Connection" domains, but it does not try to systematically include Earth Science terms. We also defer to later the question of a uniform description of "service resources" such as web-based format translators or display tools. We initially intend a level of description that will allow a scientist to use the data retrieved, and will add later a set of terms to describe specific access methods for direct data retrieval. At all stages, broad community input and feedback is essential.

2.2. What is its use?

The Data Model provides a set of terms that, ideally, can be mapped onto the terms used for specific products, thus providing a uniform means of access and description. The data model is intended to provide the cornerstone of one or more "Virtual Observatories" that will link broad ranges of solar and space physics in a natural way. More specifically, the data model should:

(1) Provide a way of registering products using a standard set of terms that allow the products to be found with simple searches and described so that users can determine their utility for a specific purpose;

(2) Allow searching for products containing particular physical quantities (e.g., magnetic field; spectral irradiance) that are variously represented in a diverse array of data products; and

(3) Create a means of mapping comparable variables from many products onto a common set of terms so that visualization, analysis, and higher-order query tools and services can be used on all of them without regard to the origin of the data.

The accomplishment of these tasks requires "middleware" (either at the provider or in a VxO) that understands product registries and performs the translations needed to map the idiosyncratic product and parameter names of each repository onto the standard terms. This intermediate layer, which can take many forms for different purposes, will provide the links necessary to connect user applications and search-and-retrieval front ends to data repositories. Ultimately, the data environment centered on the data model will involve a number of software tools as well, linked together as internet-based services or other means. Specific software tools and documentation associated with products will be straightforwardly accessible. This "system" has the potential to provide capabilities that can aid even expert users of a particular dataset (e.g., on-the-fly coordinate transformations, the ability to merge datasets from different instruments, easy reference to related indices or other data), in addition to providing the broad access needed to solve global problems in Sun-Earth connection physics. Success will require a concerted cooperative effort across disciplines. Existing efforts in Space and Solar Physics as well as in other areas such as Earth and Planetary Sciences and Astronomy will guide the work.

2.3. What process led to the current Data Model?

The data model presented here has grown from the efforts begun in 2002 that became formalized in regular teleconferences of a group of interested data providers, including scientific and technical representatives of some of the largest data holdings in the US, Europe, and Japan. As the effort to provide seamless access to distributed data proceeded, it became clear that the data model efforts were central. Thus, in March of 2003 a meeting of many of the people in the Contributors list at the beginning of this document was convened to begin the data model construction in earnest. The initial effort involved collecting terms from CDPP, SWRI, NSSDC, ISTP, and other sets to form a starting point. Two years of teleconferences, e-mailed revisions, and occasional face-to-face efforts, along with the application of the terms to specific cases, led to the release of version 1.0 of the data in November 2005. The version of the data model described in this document is an extension of this earlier release.

The general philosophy of the Data Model is to describe products using a natural taxonomy of data sources and of the physical world as represented in actual or potential datasets and models. The resulting Data Model has been put to many tests, but will have to evolve as new products are considered.

## 2.4. The Data Model in a Virtual Observatory context

The current conceptual model is intended to serve as the basis for interoperability between independent data systems. It is an attempt to capture the various concepts that are used to represent

the knowledge to be shared in the Space and Solar Physics domains. These concepts are used to convey queries and responses between the user and various remote data systems. Many such systems, in diverse fields, are now functioning or planned. The paradigm for this interoperability is the "Virtual Observatory", originally coined by the astronomical community as a way to allow any researcher, anywhere in the world, to access all known observations of a chosen patch of the sky using the Internet to query repositories of information distributed around the world at data centers and observatories.

The concepts presented in this document are independent of any implementation, but we have in mind a likely map of the eventual data environment. Figure 1 illustrates a possible architecture; the details will depend on the outcome of a number of current efforts and their coordination. The web site http://lwsde.gsfc.nasa.gov gives a guide to many currently active projects and a great deal of background information. Of particular interest there is the document entitled, "A Framework for Space and Solar Physics Virtual Observatories."

Figure 1 is very schematic, but the "Access Points" could be discipline specific "VxOs" that aggregate the repositories they serve, making them all appear as one. This is now done by the VSO for solar data. The VSO can then be treated as a repository by other services (VSPO and EGSO currently do this). The "Gateways" in the figure would be places where large numbers of products are registered with pointers to Access Points, Repositories, and other services (not shown) as needed. With the right connections and a common language, the data environment becomes very rich and flexible. Note that more conventional access to any of the Repositories could continue as before.
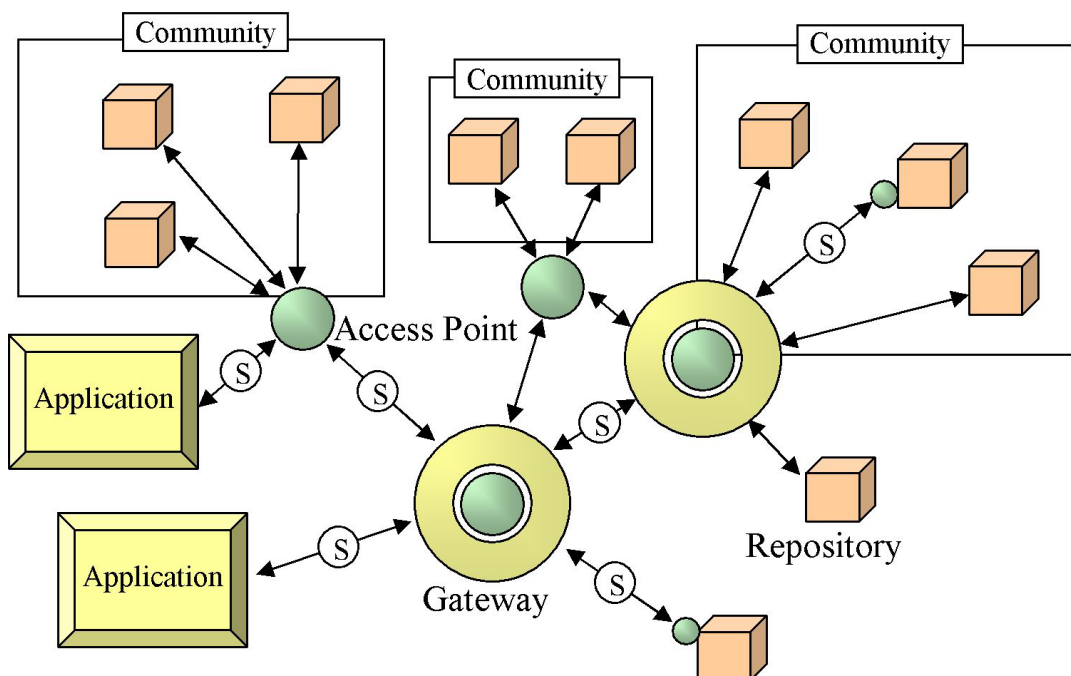
Figure 1: A possible data environment architecture. Information and data flows from Repositories to Applications through Access Points and Gateways. In this model, any Access Point or Gateway may be considered an instance of a Virtual Observatory. The portions of the system using SPASE-Data-Model-based messages are indicated with the Ⓢ.

A prototypical usage scenario is:

1. The scientist uses an application (e.g., a browser or IDL) to define his query in terms of the SPASE model.

2. The application contacts a relevant participating access point or gateway that may generate a response (e.g. URLs of files or services, or metadata about these), or may pass the query to other access points or gateways to obtain further information before responding to the query.

3. The application uses the replies either to present metadata to the user or to request the resource. A request may go directly to a repository or an access point, or may be routed through a gateway for additional services.

4. The requested resources might be processed in various ways at the repository, the access point, the gateway, or by a separate service. For example, the system may assemble a collection of resources, subset the data, generate a graphic, or reformat the resource prior to delivering it to the application.

We envision that different control authorities will maintain different aspects of the Data Model. For example, the list of observatory names is maintained by NSSDC, the definition of prime meridian used in describing local latitude and longitude is set by IAU, and the accepted format for time representation is defined by ISO. There will need to be a community-approved group to be the central authority on the Data Model; SPASE is currently serving as a prototype for this role.

It remains to be determined the extent to which registries of products will be centralized such that one location will contain the latest list obtained from registered data providers. There should be at least one common format for the exchange of product registries and metadata. An XML schema based format will likely provide the preferred method.

3. Data Model overview and general concepts

Special Note: In other data models what SPASE would call "granules" are sometimes referred to as "files" or "products"; and what SPASE refers to as a "product" is sometimes called "datasets".

As mentioned in the introduction, this Data Model focuses on describing Data Products, which are a subset of Resources. In general, each Resource Type consists of a similar collection of things that share a common descriptive hierarchy. Numerical Data and Display Data (pre-rendered Plots and Images based on data) are typically defined as collections of files that differ only in the time of the observations to which they refer. Note that what is delivered to the user may be generated dynamically from underlying files, and thus can be more variable: for a particular product, modes may change with time of observation, and calibrations with time of processing. Thus, in general, the delineation of a product is up to the providers. All of the terms in the Model require a precise definition to be useful, and these are provided in the Dictionary.

The SPASE Data Model describes Data Products by stating what was observed and where and when the data were obtained, as well as giving the source of the observations, and the location (repository), format and other technical aspects of the data. These descriptions are expressed using the appropriate Resource Type from the Data Model.

3.1. Resources

At the top level of the present Data Model is the Resource Type. These consist of the Product Types:

> Numerical Data,
> Display Data, and
> Catalog

and the Resource Types that support these:

> Observatory,
> Instrument,
> Registry,
> Repository,
> Service,
> Granule,
> Person, and
> Extension.

Each of these types has its own set of terms. The present version of the dictionary provides a core set of terms that may be augmented by SPASE in the future. One method of providing external augmentation is through a URL that will provide the user with more information to supplement the metadata.

A set of Elements (the general model term for what could roughly be termed a keyword) is common to all Resource descriptions (with the exception of Granule, Person and Extension); they are grouped in a Resource Header, consisting primarily of:

> Resource Name
> Alternate Name
> Release Date
> Description
> Acknowledgement
> Contact
> Information URL
> Association ID

For Data Products, a similar set is grouped as Access Information, which can be replicated with the appropriate changes to describe copies of the product which may differ only in format, encoding or location. The Access Information provides the:

> Repository ID
> Availability
> Access Rights
> Access URL
> Caveats
> Format

Encoding
Acknowledgement

These general elements are often free text, although Instrument Name, Format, and various other terms are from well defined enumerated lists. Having enumerated lists will allow searches to be more efficient, so that, for example, a simple query will isolate all registered products from a particular Region without worrying about many more-or- less equivalent terms.

3.2. Resource Identifiers

Every resource has a unique identifier so that it can tracked and referenced within a system. This identfier is defined by the authority for the resource. The entity which acts as the authority is determined by agency or group who provides the resource. Each resource identifier is a URI that has the form

scheme://authority/path

where "scheme" is "spase" for those resources administered through the SPASE framework, "authority" is the unique identifier for the name registry within the SPASE framework and "path" is the unique local identifier of the resource within the context of the "authority". The resource ID must be unique within the SPASE framework. This is assured as long as each "authority" is unique and each authority insures that the "path" is unique within its context.

To illustrate the definition of a resource identifier consider that there is a registered "authority" called "nssdc" which maintains information for spacecraft resources. One such spacecraft is GOES-8. Now "nssdc" decides that the "path" to the GOES-8 resource will be "GOES-8". So, the resource identifier would be:

spase://nssdc/GOES-8

It should then be possible in an operating system to provide the resource identifier to a service and that service would return the SPASE description of the resource.

3.3. Numerical Data Resources

Since Numerical Data resources are the key to most science investigations, our focus has been on providing a Data Model that will provide users with a means to exploit these data. It will be useful to agree on a uniform means for accessing the data (standard conventions for how to describe file naming and variable access methods), but initially our focus is on the scientific content of the data. We have initial sets of terms for the other Product Types, but these are less detailed; in many cases we expect much less detail will be needed even in the more final form.

The essential information for a Numerical Data resource description consists of what measured it, where to get it, its basic Measurement Type, whom to ask about it, and a few other simple descriptors. Of course, the more detailed the description, the more likely it is that users will understand what a product is and be more able and likely to use it.

Numerical Data resources (called "Datasets" in some systems) are described by the Headers plus

other elements, including:

> Observatory ID (link to Resource description)
> Instrument ID (also a link)
> Measurement Type (the general category, such as Thermal Plasma)
> Temporal Description (time range available, resolution)
> Observed Region (the source of data)
> Physical Parameter (very useful)

Other elements are part of a Numerical Data resource and can be used to provide additional details.

Each Physical Parameter segment of a Product Descriptor is a description of a physical quantity that the provider wishes to advertise in the product. The Product Descriptor could have just one such segment describing image data as being a full-Sun image in white light, or it could contain many segments for the various parameters (density, temperature, velocity, variance in these, error bars, and quality flags) for a thermal plasma product. Each Physical Parameter would be described by a standard set of elements including:

> Name
> Parameter Key
> Description
> Caveats
> Cadence
> Units
> Units Conversion
> Coordinate System
> Dimension
> Measured
> Support

Measured parameters are organized into four categories:

> Photons: which are electromagnetic fields
> Fields: distinguished from Photons by being measured as time series
> Particles: which are forms of matter; and
> Mixed: which are composite or derived quantities.

Support parameters are characterized by its intrinsic type though an enumeration which includes:

> Positional: the location of a observation
> Temporal: the time of a observation
> Other: important, but unclassified parameters

with details of the parameter provided though the Structure information.

Each category has its own set of elements (and enumerated) lists based on the natural taxonomy of

the physical world.

3.4. Display Data Resources

Display Data resources are very similar to Numerical Data resource, since they are based on the data, but are preprocessed images in, for example, JPEG, GIF or PNG format that show a picture of a graph or of an object or region. Generally these products will be summaries or browse-level images of data plots, so less detail will be needed in their description. The convention chosen here is that, for example, the FITS file containing the data for a solar H-alpha image is part of a Numerical Data Product, whereas a GIF or JPEG produced from that file, which is more difficult to use for quantitative purposes, is part of a Display Data Product. The Display Data resource can be associated (or coupled) to the Numerical Data resource by assigning the Resource ID of the Numerical Data resource to the Association ID in the Resource Header of Display Data resource.

3.5. Catalog Resources

Catalogs can include complete listings of files and the times they cover, but this is not the main intent here. Rather, a Catalog will typically consist of a set of start and stop times for "events" which can be anything from Coronal Mass Ejection occurrences in SOHO images, to intervals when data are available in a particular product, to identifications of when a spacecraft is in a particular region such as the Earth's magnetosheath. These types of catalogs are already being used for assistance in data searches by VSO and EGSO.

Another type of catalog is one that provides summary or statistical information for a Numerical Data resource. In this case the catalog can be associated with the Numerical Data resource by using the Association ID in the Resource Header.

3.6. Granules

Granules are a special type of resource which describes a piece of another resource such as a Numerical Data resource or Display Data resource. A Granule must reference which resource it is assocated with through its Parent ID element. The Granule inherits all the attributes of the parent resource. A Granule may be composed of one or more physical pieces (files) which are considered inseperable. For example, a data storage format that maintains metadata and binary data in seperate, but tightly coupled files. Granules should not be used to group files that have simple relationships or which are associated through a parent resource. For example, each file containing a time interval data for a Numerical Data resource would each be considered a Granule.

3.7. Extension

An Extension resource contains other metadata which is not part of the SPASE data model. The contents of this element are defined by individual usage. The organization and content are constrained by the implementation. For example, in an XML representation of the SPASE metadata the content must conform to the XML specications.

3.8. Other Resource Types

The "nonproduct" Resource types are generally self-explanatory. They are:

> Instrument: A device which is used to sense and parameterize a physical phenomenon.
> Observatory: A spacecraft, a cluster of spacecraft, groundbased chains, etc.

Person: An individual human being.
Respository: A storage point for resources
Registry: An inventory of available resources
Service: A location or facility that can perform a well defined task.

3.9. Future Direction

Future versions of the SPASE Data Model will include terms for Software (tools for use of data), Models (physics- and empirically-based predictive schemes, often in the form of programs), Documents (focusing on support documents for other resources rather than on scientific papers) and other resources as the need arises.

3.10. General Considerations

The SPASE Entity-Relationship Tree of Section 3 has been produced from information held in a data base. This database also holds all the element definitions which are explained in Section 5 and tabulated in Section 6. From this database it is also possible to generate an XSD schema, which is the default encoding that has been developed for evaluating the Data Model. Thus, Resources are most naturally described by XML files, but this is not essential. The SPASE Data Model is implementation neutral and can be implemented using other grammars and technologies.

A PDF version of this document can be downloaded from the SPASE site, http://www.spase-group.org/

4. The Data Model presented hierarchically

The taxonomy tree shows the inter-relationship of elements in the data model. This provides a "big picture" view of the SPASE data model. This taxonomy is implementation neutral. Details for each element are contained in the data dictionary.

Notes: Occurence specifications are enclosed in parenthesis: 0 = optional, 1 = required, * = zero or more, + = 1 or more

```
+ Spase (1)
|     + Version (1)
|     + Catalog (* of A)
|     |      + Resource ID (1)
|     |      + Resource Header (1)
|     |      |      + Resource Name (1)
|     |      |      + Alternate Name (*)
|     |      |      + Release Date (1)
|     |      |      + Expiration Date (0)
|     |      |      + Description (1)
|     |      |      + Acknowledgement (0)
|     |      |      + Contact (+)
|     |      |      |      + Person ID (1)
|     |      |      |      + Role (+)
|     |      |      + Information URL (*)
|     |      |      |      + Name (0)
|     |      |      |      + URL (1)
|     |      |      |      + Description (0)
|     |      |      + Association ID (*)
|     |      |      + Prior ID (*)
|     |      + Access Information (+)
|     |      |      + Repository ID (1)
|     |      |      + Availability (0)
|     |      |      + Access Rights (0)
|     |      |      + Access URL (+)
|     |      |      |      + Name (0)
|     |      |      |      + URL (1)
|     |      |      |      + Description (0)
|     |      |      |      + Language (0)
|     |      |      + Format (1)
|     |      |      + Encoding (0)
|     |      |      + Data Extent (0)
|     |      |      |      + Quantity (1)
|     |      |      |      + Units (0)
|     |      |      |      + Per (0)
|     |      |      + Acknowledgement (0)
|     |      + Provider Resource Name (0)
|     |      + Provider Version (0)
|     |      + Instrument ID (*)
|     |      + Phenomenon Type (+)
|     |      + Time Span (0)
|     |      |      + Start Date (1)
```

```
|     |     |        + Stop Date (1 of B)
|     |     |        + Relative Stop Date (1 of B)
|     |     |        + Note (*)
|     |     + Caveats (0)
|     |     + Keyword (*)
|     |     + Input Resource ID (*)
|     |     + Physical Parameter (*)
|     |     |        + Name (1)
|     |     |        + Parameter Key (0)
|     |     |        + Description (0)
|     |     |        + Caveats (0)
|     |     |        + Cadence (0)
|     |     |        + Units (0)
|     |     |        + Units Conversion (0)
|     |     |        + Coordinate System (0)
|     |     |        |     + Coordinate Representation (0)
|     |     |        |     + Coordinate System Name (0)
|     |     |        + Structure (0)
|     |     |        |     + Size (0)
|     |     |        |     + Description (0)
|     |     |        |     + Element (*)
|     |     |        |     |     + Name (1)
|     |     |        |     |     + Component (0)
|     |     |        |     |     + Index (1)
|     |     |        |     |     + Parameter Key (0)
|     |     |        |     |     + Units (0)
|     |     |        |     |     + Units Conversion (0)
|     |     |        |     |     + ValidMin (0)
|     |     |        |     |     + ValidMax (0)
|     |     |        |     |     + FillValue (0)
|     |     |        + ValidMin (0)
|     |     |        + ValidMax (0)
|     |     |        + FillValue (0)
|     |     |        + Measured (1 of C)
|     |     |        |     + Field (1 of D)
|     |     |        |     |     + Field Qualifier (*)
|     |     |        |     |     + Field Quantity (1)
|     |     |        |     |     + Frequency Range (0)
|     |     |        |     |     |     + Spectral Range (0)
|     |     |        |     |     |     + Low (1)
|     |     |        |     |     |     + High (1)
|     |     |        |     |     |     + Units (1)
|     |     |        |     |     |     + Bin (*)
|     |     |        |     |     |     |     + Band Name (0)
|     |     |        |     |     |     |     + Low (1)
|     |     |        |     |     |     |     + High (1)
|     |     |        |     + Particle (1 of D)
|     |     |        |     |     + Particle Type (+)
|     |     |        |     |     + Particle Qualifier (*)
|     |     |        |     |     + Particle Quantity (1)
|     |     |        |     |     + Atomic Number (*)
```

```
|    |    |    |    |         + Energy Range (0)
|    |    |    |    |    |         + Spectral Range (0)
|    |    |    |    |    |         + Low (1)
|    |    |    |    |    |         + High (1)
|    |    |    |    |    |         + Units (1)
|    |    |    |    |    |         + Bin (*)
|    |    |    |    |    |    |         + Band Name (0)
|    |    |    |    |    |    |         + Low (1)
|    |    |    |    |    |    |         + High (1)
|    |    |    |    |         + Azimuthal Angle Range (0)
|    |    |    |    |    |         + Low (1)
|    |    |    |    |    |         + High (1)
|    |    |    |    |    |         + Units (1)
|    |    |    |    |    |         + Bin (*)
|    |    |    |    |    |    |         + Band Name (0)
|    |    |    |    |    |    |         + Low (1)
|    |    |    |    |    |    |         + High (1)
|    |    |    |    |         + Polar Angle Range (0)
|    |    |    |    |    |         + Low (1)
|    |    |    |    |    |         + High (1)
|    |    |    |    |    |         + Units (1)
|    |    |    |    |    |         + Bin (*)
|    |    |    |    |    |    |         + Band Name (0)
|    |    |    |    |    |    |         + Low (1)
|    |    |    |    |    |    |         + High (1)
|    |    |    |    + Photon (1 of D)
|    |    |    |    |         + Photon Qualifier (*)
|    |    |    |    |         + Photon Quantity (1)
|    |    |    |    |         + Energy Range (0)
|    |    |    |    |    |         + Spectral Range (0)
|    |    |    |    |    |         + Low (1)
|    |    |    |    |    |         + High (1)
|    |    |    |    |    |         + Units (1)
|    |    |    |    |    |         + Bin (*)
|    |    |    |    |    |    |         + Band Name (0)
|    |    |    |    |    |    |         + Low (1)
|    |    |    |    |    |    |         + High (1)
|    |    |    |    |         + Wavelength Range (0)
|    |    |    |    |    |         + Spectral Range (0)
|    |    |    |    |    |         + Low (1)
|    |    |    |    |    |         + High (1)
|    |    |    |    |    |         + Units (1)
|    |    |    |    |    |         + Bin (*)
|    |    |    |    |    |    |         + Band Name (0)
|    |    |    |    |    |    |         + Low (1)
|    |    |    |    |    |    |         + High (1)
|    |    |    |    |         + Frequency Range (0)
|    |    |    |    |    |         + Spectral Range (0)
|    |    |    |    |    |         + Low (1)
|    |    |    |    |    |         + High (1)
|    |    |    |    |    |         + Units (1)
```

```
|     |     |     |     |     |     + Bin (*)
|     |     |     |     |     |     |     + Band Name (0)
|     |     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     |     + High (1)
|     |     |     |     + Mixed (1 of D)
|     |     |     + Support (1 of C)
|     |     |     |     + Support Quantity (1)
|     |     + Extension (*)
|     + Display Data (* of A)
|     |     + Resource ID (1)
|     |     + Resource Header (1)
|     |     |     + Resource Name (1)
|     |     |     + Alternate Name (*)
|     |     |     + Release Date (1)
|     |     |     + Expiration Date (0)
|     |     |     + Description (1)
|     |     |     + Acknowledgement (0)
|     |     |     + Contact (+)
|     |     |     |     + Person ID (1)
|     |     |     |     + Role (+)
|     |     |     + Information URL (*)
|     |     |     |     + Name (0)
|     |     |     |     + URL (1)
|     |     |     |     + Description (0)
|     |     |     + Association ID (*)
|     |     |     + Prior ID (*)
|     |     + Access Information (+)
|     |     |     + Repository ID (1)
|     |     |     + Availability (0)
|     |     |     + Access Rights (0)
|     |     |     + Access URL (+)
|     |     |     |     + Name (0)
|     |     |     |     + URL (1)
|     |     |     |     + Description (0)
|     |     |     |     + Language (0)
|     |     |     + Format (1)
|     |     |     + Encoding (0)
|     |     |     + Data Extent (0)
|     |     |     |     + Quantity (1)
|     |     |     |     + Units (0)
|     |     |     |     + Per (0)
|     |     |     + Acknowledgement (0)
|     |     + Processing Level (0)
|     |     + Provider Resource Name (0)
|     |     + Provider Processing Level (0)
|     |     + Provider Version (0)
|     |     + Instrument ID (*)
|     |     + Measurement Type (+)
|     |     + Temporal Description (0)
|     |     |     + Time Span (1)
|     |     |     |     + Start Date (1)
```

```
|    |    |    |    + Stop Date (1 of B)
|    |    |    |    + Relative Stop Date (1 of B)
|    |    |    |    + Note (*)
|    |    |    + Cadence (0)
|    |    |    + Exposure (0)
|    |    + Spectral Range (*)
|    |    + Display Cadence (0)
|    |    + Observed Region (*)
|    |    + Caveats (0)
|    |    + Keyword (*)
|    |    + Input Resource ID (*)
|    |    + Physical Parameter (*)
|    |    |    + Name (1)
|    |    |    + Parameter Key (0)
|    |    |    + Description (0)
|    |    |    + Caveats (0)
|    |    |    + Cadence (0)
|    |    |    + Units (0)
|    |    |    + Units Conversion (0)
|    |    |    + Coordinate System (0)
|    |    |    |    + Coordinate Representation (0)
|    |    |    |    + Coordinate System Name (0)
|    |    |    + Structure (0)
|    |    |    |    + Size (0)
|    |    |    |    + Description (0)
|    |    |    |    + Element (*)
|    |    |    |    |    + Name (1)
|    |    |    |    |    + Component (0)
|    |    |    |    |    + Index (1)
|    |    |    |    |    + Parameter Key (0)
|    |    |    |    |    + Units (0)
|    |    |    |    |    + Units Conversion (0)
|    |    |    |    |    + ValidMin (0)
|    |    |    |    |    + ValidMax (0)
|    |    |    |    |    + FillValue (0)
|    |    |    + ValidMin (0)
|    |    |    + ValidMax (0)
|    |    |    + FillValue (0)
|    |    |    + Measured (1 of C)
|    |    |    |    + Field (1 of D)
|    |    |    |    |    + Field Qualifier (*)
|    |    |    |    |    + Field Quantity (1)
|    |    |    |    |    + Frequency Range (0)
|    |    |    |    |    |    + Spectral Range (0)
|    |    |    |    |    |    + Low (1)
|    |    |    |    |    |    + High (1)
|    |    |    |    |    |    + Units (1)
|    |    |    |    |    |    + Bin (*)
|    |    |    |    |    |    |    + Band Name (0)
|    |    |    |    |    |    |    + Low (1)
|    |    |    |    |    |    |    + High (1)
```

```
|   |   |   |           + Particle (1 of D)
|   |   |   |   |           + Particle Type (+)
|   |   |   |   |           + Particle Qualifier (*)
|   |   |   |   |           + Particle Quantity (1)
|   |   |   |   |           + Atomic Number (*)
|   |   |   |   |           + Energy Range (0)
|   |   |   |   |   |           + Spectral Range (0)
|   |   |   |   |   |           + Low (1)
|   |   |   |   |   |           + High (1)
|   |   |   |   |   |           + Units (1)
|   |   |   |   |   |           + Bin (*)
|   |   |   |   |   |   |           + Band Name (0)
|   |   |   |   |   |   |           + Low (1)
|   |   |   |   |   |   |           + High (1)
|   |   |   |   |           + Azimuthal Angle Range (0)
|   |   |   |   |   |           + Low (1)
|   |   |   |   |   |           + High (1)
|   |   |   |   |   |           + Units (1)
|   |   |   |   |   |           + Bin (*)
|   |   |   |   |   |   |           + Band Name (0)
|   |   |   |   |   |   |           + Low (1)
|   |   |   |   |   |   |           + High (1)
|   |   |   |   |           + Polar Angle Range (0)
|   |   |   |   |   |           + Low (1)
|   |   |   |   |   |           + High (1)
|   |   |   |   |   |           + Units (1)
|   |   |   |   |   |           + Bin (*)
|   |   |   |   |   |   |           + Band Name (0)
|   |   |   |   |   |   |           + Low (1)
|   |   |   |   |   |   |           + High (1)
|   |   |   |           + Photon (1 of D)
|   |   |   |   |           + Photon Qualifier (*)
|   |   |   |   |           + Photon Quantity (1)
|   |   |   |   |           + Energy Range (0)
|   |   |   |   |   |           + Spectral Range (0)
|   |   |   |   |   |           + Low (1)
|   |   |   |   |   |           + High (1)
|   |   |   |   |   |           + Units (1)
|   |   |   |   |   |           + Bin (*)
|   |   |   |   |   |   |           + Band Name (0)
|   |   |   |   |   |   |           + Low (1)
|   |   |   |   |   |   |           + High (1)
|   |   |   |   |           + Wavelength Range (0)
|   |   |   |   |   |           + Spectral Range (0)
|   |   |   |   |   |           + Low (1)
|   |   |   |   |   |           + High (1)
|   |   |   |   |   |           + Units (1)
|   |   |   |   |   |           + Bin (*)
|   |   |   |   |   |   |           + Band Name (0)
|   |   |   |   |   |   |           + Low (1)
|   |   |   |   |   |   |           + High (1)
```

```
|     |     |     |     |        + Frequency Range (0)
|     |     |     |     |     |     + Spectral Range (0)
|     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     + High (1)
|     |     |     |     |     |     + Units (1)
|     |     |     |     |     |     + Bin (*)
|     |     |     |     |     |     |     + Band Name (0)
|     |     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     |     + High (1)
|     |     |     |     + Mixed (1 of D)
|     |     |     + Support (1 of C)
|     |     |     |     + Support Quantity (1)
|     |     + Extension (*)
|     + Numerical Data (* of A)
|     |     + Resource ID (1)
|     |     + Resource Header (1)
|     |     |     + Resource Name (1)
|     |     |     + Alternate Name (*)
|     |     |     + Release Date (1)
|     |     |     + Expiration Date (0)
|     |     |     + Description (1)
|     |     |     + Acknowledgement (0)
|     |     |     + Contact (+)
|     |     |     |     + Person ID (1)
|     |     |     |     + Role (+)
|     |     |     + Information URL (*)
|     |     |     |     + Name (0)
|     |     |     |     + URL (1)
|     |     |     |     + Description (0)
|     |     |     + Association ID (*)
|     |     |     + Prior ID (*)
|     |     + Access Information (+)
|     |     |     + Repository ID (1)
|     |     |     + Availability (0)
|     |     |     + Access Rights (0)
|     |     |     + Access URL (+)
|     |     |     |     + Name (0)
|     |     |     |     + URL (1)
|     |     |     |     + Description (0)
|     |     |     |     + Language (0)
|     |     |     + Format (1)
|     |     |     + Encoding (0)
|     |     |     + Data Extent (0)
|     |     |     |     + Quantity (1)
|     |     |     |     + Units (0)
|     |     |     |     + Per (0)
|     |     |     + Acknowledgement (0)
|     |     + Processing Level (0)
|     |     + Provider Resource Name (0)
|     |     + Provider Processing Level (0)
|     |     + Provider Version (0)
```

```
|    |        + Instrument ID (*)
|    |        + Measurement Type (+)
|    |        + Temporal Description (0)
|    |        |    + Time Span (1)
|    |        |    |    + Start Date (1)
|    |        |    |    + Stop Date (1 of B)
|    |        |    |    + Relative Stop Date (1 of B)
|    |        |    |    + Note (*)
|    |        |    + Cadence (0)
|    |        |    + Exposure (0)
|    |        + Spectral Range (*)
|    |        + Observed Region (*)
|    |        + Caveats (0)
|    |        + Keyword (*)
|    |        + Input Resource ID (*)
|    |        + Physical Parameter (*)
|    |        |    + Name (1)
|    |        |    + Parameter Key (0)
|    |        |    + Description (0)
|    |        |    + Caveats (0)
|    |        |    + Cadence (0)
|    |        |    + Units (0)
|    |        |    + Units Conversion (0)
|    |        |    + Coordinate System (0)
|    |        |    |    + Coordinate Representation (0)
|    |        |    |    + Coordinate System Name (0)
|    |        |    + Structure (0)
|    |        |    |    + Size (0)
|    |        |    |    + Description (0)
|    |        |    |    + Element (*)
|    |        |    |    |    + Name (1)
|    |        |    |    |    + Component (0)
|    |        |    |    |    + Index (1)
|    |        |    |    |    + Parameter Key (0)
|    |        |    |    |    + Units (0)
|    |        |    |    |    + Units Conversion (0)
|    |        |    |    |    + ValidMin (0)
|    |        |    |    |    + ValidMax (0)
|    |        |    |    |    + FillValue (0)
|    |        |    + ValidMin (0)
|    |        |    + ValidMax (0)
|    |        |    + FillValue (0)
|    |        |    + Measured (1 of C)
|    |        |    |    + Field (1 of D)
|    |        |    |    |    + Field Qualifier (*)
|    |        |    |    |    + Field Quantity (1)
|    |        |    |    |    + Frequency Range (0)
|    |        |    |    |    |    + Spectral Range (0)
|    |        |    |    |    |    + Low (1)
|    |        |    |    |    |    + High (1)
|    |        |    |    |    |    + Units (1)
```

```
|     |     |     |     |     |     |     + Bin (*)
|     |     |     |     |     |     |          + Band Name (0)
|     |     |     |     |     |     |          + Low (1)
|     |     |     |     |     |     |          + High (1)
|     |     |     |     + Particle (1 of D)
|     |     |     |     |     + Particle Type (+)
|     |     |     |     |     + Particle Qualifier (*)
|     |     |     |     |     + Particle Quantity (1)
|     |     |     |     |     + Atomic Number (*)
|     |     |     |     |     + Energy Range (0)
|     |     |     |     |     |     + Spectral Range (0)
|     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     + High (1)
|     |     |     |     |     |     + Units (1)
|     |     |     |     |     |     + Bin (*)
|     |     |     |     |     |     |     + Band Name (0)
|     |     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     |     + High (1)
|     |     |     |     |     + Azimuthal Angle Range (0)
|     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     + High (1)
|     |     |     |     |     |     + Units (1)
|     |     |     |     |     |     + Bin (*)
|     |     |     |     |     |     |     + Band Name (0)
|     |     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     |     + High (1)
|     |     |     |     |     + Polar Angle Range (0)
|     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     + High (1)
|     |     |     |     |     |     + Units (1)
|     |     |     |     |     |     + Bin (*)
|     |     |     |     |     |     |     + Band Name (0)
|     |     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     |     + High (1)
|     |     |     |     + Photon (1 of D)
|     |     |     |     |     + Photon Qualifier (*)
|     |     |     |     |     + Photon Quantity (1)
|     |     |     |     |     + Energy Range (0)
|     |     |     |     |     |     + Spectral Range (0)
|     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     + High (1)
|     |     |     |     |     |     + Units (1)
|     |     |     |     |     |     + Bin (*)
|     |     |     |     |     |     |     + Band Name (0)
|     |     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     |     + High (1)
|     |     |     |     |     + Wavelength Range (0)
|     |     |     |     |     |     + Spectral Range (0)
|     |     |     |     |     |     + Low (1)
|     |     |     |     |     |     + High (1)
|     |     |     |     |     |     + Units (1)
```

```
|      |      |      |      |      |      |   + Bin (*)
|      |      |      |      |      |      |      + Band Name (0)
|      |      |      |      |      |      |      + Low (1)
|      |      |      |      |      |      |      + High (1)
|      |      |      |      |      | + Frequency Range (0)
|      |      |      |      |      |      + Spectral Range (0)
|      |      |      |      |      |      + Low (1)
|      |      |      |      |      |      + High (1)
|      |      |      |      |      |      + Units (1)
|      |      |      |      |      |      + Bin (*)
|      |      |      |      |      |      |      + Band Name (0)
|      |      |      |      |      |      |      + Low (1)
|      |      |      |      |      |      |      + High (1)
|      |      |      |      | + Mixed (1 of D)
|      |      |      | + Support (1 of C)
|      |      |      |      + Support Quantity (1)
|      |      + Extension (*)
|      + Document (* of A)
|      |      + Resource ID (1)
|      |      + Resource Header (1)
|      |      |      + Resource Name (1)
|      |      |      + Alternate Name (*)
|      |      |      + Release Date (1)
|      |      |      + Expiration Date (0)
|      |      |      + Description (1)
|      |      |      + Acknowledgement (0)
|      |      |      + Contact (+)
|      |      |      |      + Person ID (1)
|      |      |      |      + Role (+)
|      |      |      + Information URL (*)
|      |      |      |      + Name (0)
|      |      |      |      + URL (1)
|      |      |      |      + Description (0)
|      |      |      + Association ID (*)
|      |      |      + Prior ID (*)
|      |      + Access Information (+)
|      |      |      + Repository ID (1)
|      |      |      + Availability (0)
|      |      |      + Access Rights (0)
|      |      |      + Access URL (+)
|      |      |      |      + Name (0)
|      |      |      |      + URL (1)
|      |      |      |      + Description (0)
|      |      |      |      + Language (0)
|      |      |      + Format (1)
|      |      |      + Encoding (0)
|      |      |      + Data Extent (0)
|      |      |      |      + Quantity (1)
|      |      |      |      + Units (0)
|      |      |      |      + Per (0)
|      |      |      + Acknowledgement (0)
```

```
|       |       + Keyword (*)
|       |       + Document Type (1)
|       |       + Input Resource ID (*)
|       + Granule (* of A)
|       |       + Resource ID (1)
|       |       + Release Date (1)
|       |       + Expiration Date (0)
|       |       + Parent ID (1)
|       |       + Prior ID (*)
|       |       + URL (+)
|       |       + Start Date (1)
|       |       + Stop Date (1)
|       |       + Checksum (0)
|       |       |       + Hash Value (1)
|       |       |       + Hash Function (1)
|       |       + Data Extent (0)
|       |       |       + Quantity (1)
|       |       |       + Units (0)
|       |       |       + Per (0)
|       |       + Extension (*)
|       + Instrument (* of A)
|       |       + Resource ID (1)
|       |       + Resource Header (1)
|       |       |       + Resource Name (1)
|       |       |       + Alternate Name (*)
|       |       |       + Release Date (1)
|       |       |       + Expiration Date (0)
|       |       |       + Description (1)
|       |       |       + Acknowledgement (0)
|       |       |       + Contact (+)
|       |       |       |       + Person ID (1)
|       |       |       |       + Role (+)
|       |       |       + Information URL (*)
|       |       |       |       + Name (0)
|       |       |       |       + URL (1)
|       |       |       |       + Description (0)
|       |       |       + Association ID (*)
|       |       |       + Prior ID (*)
|       |       + Instrument Type (+)
|       |       + Investigation Name (1)
|       |       + Observatory ID (1)
|       |       + Caveats (0)
|       |       + Extension (*)
|       + Observatory (* of A)
|       |       + Resource ID (1)
|       |       + Resource Header (1)
|       |       |       + Resource Name (1)
|       |       |       + Alternate Name (*)
|       |       |       + Release Date (1)
|       |       |       + Expiration Date (0)
|       |       |       + Description (1)
```

```
|      |      |      + Acknowledgement (0)
|      |      |      + Contact (+)
|      |      |      |      + Person ID (1)
|      |      |      |      + Role (+)
|      |      |      + Information URL (*)
|      |      |      |      + Name (0)
|      |      |      |      + URL (1)
|      |      |      |      + Description (0)
|      |      |      + Association ID (*)
|      |      |      + Prior ID (*)
|      |      + Observatory Group (*)
|      |      + Location (1)
|      |      |      + Observatory Region (+)
|      |      |      + Coordinate System Name (0)
|      |      |      + Latitude (0)
|      |      |      + Longitude (0)
|      |      |      + Elevation (0)
|      |      + Extension (*)
|      + Person (* of A)
|      |      + Resource ID (1)
|      |      + Release Date (0)
|      |      + Person Name (0)
|      |      + Organization Name (1)
|      |      + Address (0)
|      |      + Email (*)
|      |      + Phone Number (*)
|      |      + Extension (*)
|      |      + Fax Number (0)
|      + Registry (* of A)
|      |      + Resource ID (1)
|      |      + Resource Header (1)
|      |      |      + Resource Name (1)
|      |      |      + Alternate Name (*)
|      |      |      + Release Date (1)
|      |      |      + Expiration Date (0)
|      |      |      + Description (1)
|      |      |      + Acknowledgement (0)
|      |      |      + Contact (+)
|      |      |      |      + Person ID (1)
|      |      |      |      + Role (+)
|      |      |      + Information URL (*)
|      |      |      |      + Name (0)
|      |      |      |      + URL (1)
|      |      |      |      + Description (0)
|      |      |      + Association ID (*)
|      |      |      + Prior ID (*)
|      |      + Extension (*)
|      + Repository (* of A)
|      |      + Resource ID (1)
|      |      + Resource Header (1)
|      |      |      + Resource Name (1)
```

```
|      |      |      + Alternate Name (*)
|      |      |      + Release Date (1)
|      |      |      + Expiration Date (0)
|      |      |      + Description (1)
|      |      |      + Acknowledgement (0)
|      |      |      + Contact (+)
|      |      |      |      + Person ID (1)
|      |      |      |      + Role (+)
|      |      |      + Information URL (*)
|      |      |      |      + Name (0)
|      |      |      |      + URL (1)
|      |      |      |      + Description (0)
|      |      |      + Association ID (*)
|      |      |      + Prior ID (*)
|      |      + Extension (*)
|      + Service (* of A)
|      |      + Resource ID (1)
|      |      + Resource Header (1)
|      |      |      + Resource Name (1)
|      |      |      + Alternate Name (*)
|      |      |      + Release Date (1)
|      |      |      + Expiration Date (0)
|      |      |      + Description (1)
|      |      |      + Acknowledgement (0)
|      |      |      + Contact (+)
|      |      |      |      + Person ID (1)
|      |      |      |      + Role (+)
|      |      |      + Information URL (*)
|      |      |      |      + Name (0)
|      |      |      |      + URL (1)
|      |      |      |      + Description (0)
|      |      |      + Association ID (*)
|      |      |      + Prior ID (*)
|      |      + Access URL (1)
|      |      |      + Name (0)
|      |      |      + URL (1)
|      |      |      + Description (0)
|      |      |      + Language (0)
|      |      + Extension (*)
```

5. Guidelines for Metadata Descriptions of Products

The following sections describe the details of the SPASE Data Model, especially the metadata used to describe data. There is a richness in the available metadata that allows very detailed descriptions of products. Many of the types of metadata may not apply in your case or you may not need much detail to adequately describe your data holdings. But it must be remembered that the better data are described, the easier they will be to use.

To determine what level of detail is needed, we recommend considering not only what the user needs to find the correct data, but also what is needed to know if the data will be useful for the requestor's purpose. The user might get this information by contacting you, but if the data were moved somewhere else and only the data description were available to determine the utility, consider if the user would have sufficient information to know if this is the right data set and what problems might be associated with the use of these data. Documentation may be added as a Resource Type to a future version of the SPASE Data Model, but for now we recommend using "Information URLs," available for each resource, to provide links to more detailed information about data products and their sources.

In summary, products need not be described in minute detail, but users will need, at minimum, information for assessing what the data products represent and where to find them. Of course it is also useful to include information on how the data can be applied and common pitfalls in their use, but the first need is to make the products usefully visible.

6. Examples

As an example let us describe a person using SPASE metadata. This person is "John Smith" from Smith Foundation. While the SPASE data model is implementation neutral, XML representation is preferred. This example uses the SPASE XML form.

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<Spase>
   <Person>
      <ResourceID>spase://person/jsmith@smith.org</ResourceID>
      <PersonName>John Smith</PersonName>
      <OrganizationName>Smith Foundation</OrganizationName>
      <Address>1 Main St., Smithville, MA</Address>
      <Email>jsmith@smith.org</Email>
      <PhoneNumber>1-800-555-1212</PhoneNumber>
   </Person>
</Spase>
```

For a more extensive example let us consider a collection of numerical data from the magnetometer on the ACE spacecraft. This data set has been averaged to 1 minute intervals (cadence) and spans the beginning of the mission to the end of 2004 (1997-09-01 through 2004-12-31). The ACE spacecraft orbits the L1 point between the Earth and the Sun. While the SPASE data model is implementation neutral, XML representation is preferred. This example uses the SPASE XML form. The presented URLs are fictitious and will not direct you to the actual data.

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<Spase>
  <version>1.1.0</version>
  <NumericalData>
     <ResourceID>spase://UCLA/ACEMAG200301</ResourceID>
     <ReleaseDate>2006-07-26T00:00:00.000</ReleaseDate>
     <ResourceHeader>
        <ResourceName>ACEMAG200301</ResourceName>
        <Acknowledgement>
           User will acknowledge the data producer and instrument P.I. in any

           publication resulting from the use of these data.
        </Acknowledgement>
       <Description>
          ACE MFI 1-minute averaged magnetic-field data in GSE coordinates
          from Jan 2003. These data have been derived from the 16 second
          resolution ACE MFI which were linearly interpolated to a 1-minute
          time grid with time stamps at second zero of each minute.
       </Description>

       <Contact>
          <Role>Principal Investigator</Role>
          <PersonID>spase://person/nfness@bartol.udel.edu</PersonID>
       </Contact>

       <Contact>
          <Role>Co-Investigator</Role>
          <PresonID>spase://person/Charles.Smith@unh.edu</PersonID>
       </Contact>

       <Contact>
          <Role>Data Producer</Role>
          <PresonID>spase://person/jweygand@igpp.ucla.edu</PresonID>
```

```
            </Contact>
      </ResourceHeader>

      <AccessInformation>
         <AccessRights>Open</AccessRights>
         <Format>text</Format>
         <Encoding>GZIP</Encoding>
         <AccessURL>

<URL>http://www.igpp.ucla.edu/getResource?format=text&id=spase://UCLA/ACEMAG200
301</URL>
         </AccessURL>
      </AccessInformation>

      <AccessInformation>
         <AccessRights>Open</AccessRights>
         <Format>Matlab 7</Format>
         <Encoding>None</Encoding>
         <AccessURL>

<URL>http://www.igpp.ucla.edu/getResource?format=matlab7&id=spase://UCLA/ACEMAG
200301</URL>
         </AccessURL>
      </AccessInformation>

      <InstrumentID>spase://nssdc/ACE_MFI</InstrumentID>
      <MeasurementType>Magnetic Field</MeasurementType>

      <TemporalDescription>
         <TimeSpan>
           <StartDate>1997-01-01T00:00</StartDate>
           <EndDate>2004-01-31T23:59</EndDate>
         </TimeSpan>
         <Cadence>PT00:01:00</Cadence>
      </TemporalDescription>

      <InstrumentRegion>Heliosphere.NearEarth</InstrumentRegion>
      <ObservedRegion>Heliosphere.NearEarth</ObservedRegion>

      <PhysicalParameter>
         <Name>SAMPLE_TIME_UTC</Name>
         <ParameterKey>time</ParameterKey>
         <Description>
          Sample UTC in the form DD MM YYYY hh mm ss where
             DD   = day of month (01-31)
             MM   = month of year (01-12)
             YYYY = Gregorian Year AD
             hh   = hour of day     (00:23)
             mm   = minute of hour  (00-59)
             ss   = second of minute (00-60).
         </Description>
         <Support>
           <Temporal>UTC</Temporal>
         </Support>
      </PhysicalParameter>

      <PhysicalParameter>
         <Name>MAGNETIC_FIELD_VECTOR</Name>
         <Units>nT</Units>
         <CoordinateSystem>
            <CoordinateRepresentation>Cartesian</CoordinateRepresentation>
            <CoordinateSystemName>GSE</CoordinateSystemName>
         </CoordinateSystem>
         <Description>
```

```
            Magnetic field vector in GSE Coordinates (Bx, By, Bz).
      </Description>
      <Measured>
          <Field>
              <FieldQualifier>Vector</FieldQualifier>
              <FieldPhysicalQuantity>Magnetic</FieldPhysicalQuantity>
          </Field>
      </Measured>
    </PhysicalParameter>

    <PhysicalParameter>
      <Name>SPACECRAFT_POSITION_VECTOR</Name>
      <CoordinateSystem>
         <CoordinateRepresentation>Cartesian</CoordinateRepresentation>
         <CoordinateSystemName>GSE</CoordinateSystemName>
      </CoordinateSystem>
      <Units>EARTH RADII</Units>
      <UnitsConversion>6378.16 km</UnitsConversion>
      <Description>
         ACE spacecraft location in GSE coordinates (X,Y,Z)."
      </Description>
      <Support>
        <Positional>
            <Orientation>X</Orientation>
            <Orientation>Y</Orientation>
            <Orientation>Z</Orientation>
        </Positional>
      </Support>
    </PhysicalParameter>

  </NumericalData>
</Spase>
```

7. Definitions of the Data Model Terms

How to Read a Definition

Each element has certain attributes and context for use. The details for each element are presented in the following form:
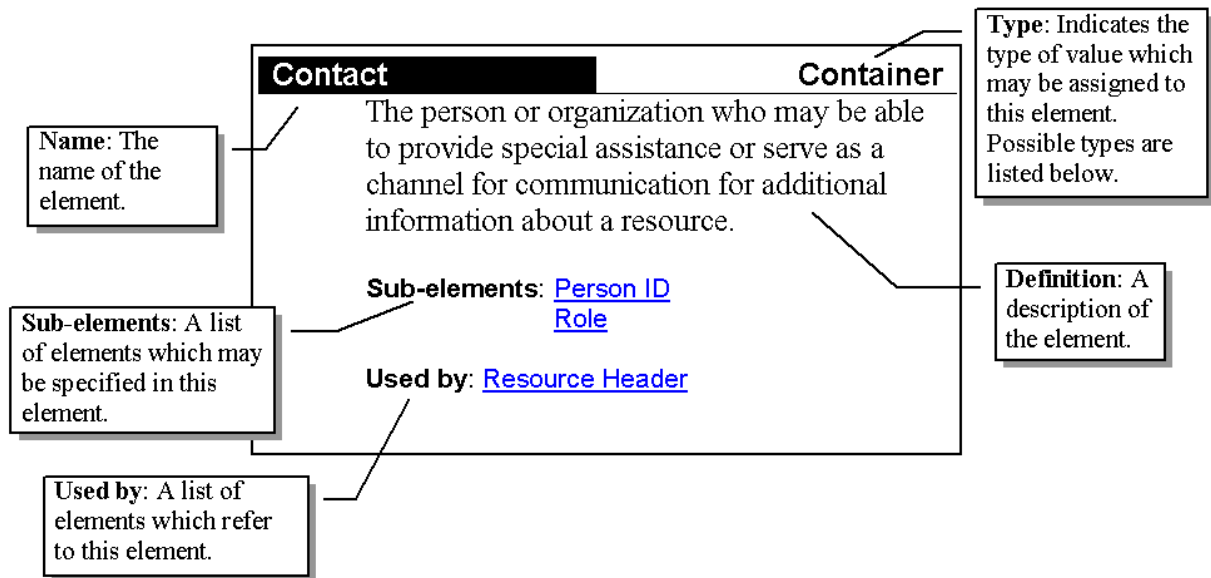
The value associated with an element must be one of the following:

ASCII   Item

A sequence of characters that adheres to American Standard Code for Information Interchange (ASCII) which is an 7-bit character-coding scheme.

AVI   Item

Audio Video Interleave (AVI) a digital format for movies that conforms to the Microsoft Windows Resource Interchange File Format (RIFF).

Access Information   Container

Attributes of the resource which pertain to how to acquire the resource, availability and storage format.
    Sub-elements:
        Access Rights
        Access URL
        Acknowledgement
        Availability
        Data Extent
        Encoding
        Format
        Repository ID

Access Rights   Enumeration

Permissions granted or denied by the host of a product to allow other users to access and use the resource.
    Allowed Values:
        Open
        Restricted

Access URL   Container

Attributes of the method of acquiring a resource including a URL, name and description.
    Sub-elements:
        Description
        Language
        Name
        URL

Acknowledgement   Text

The individual, group or organization which should be acknowledged when the data is used in or contributes to a presentation or publication.

Active Region   Item

A localized, transient volume of the solar atmosphere in which PLAGEs, SUNSPOTS, FACULAe, FLAREs, etc. may be observed.

Activity Index   Item

An indication, derived from one or more measurements, of the level of activity of an object or region, such as sunspot number, F10.7 flux, Dst, or the Polar Cap Indices.

Address   Text

Directions for finding some location; written on letters or packages that are to be delivered to that location.

Aerosol   Item

A suspension of fine solid or liquid particles in gas.

Alfven Mach Number   Item

The ratio of the bulk flow speed to the Alfven speed.

Alpha Particle   Item

A positively charged nuclear particle that consists of two protons and two neutrons.

Alternate Name	Text

An alternative or shortened name used to refer to a resource. This includes acronyms, expanded names or synonym for a resource.

Anisotropy	Item

Direction-dependent property.

Antenna	Enumeration

A sensor used to measure electric potential.

Archive Specialist	Item

An individual who is an expert on a collection of resources and may also be knowledgable of the phenomenon and related physics represented by the resources. This includes librarians, curators, archive scientists and other experts.

Array	Item

A sequence of values corresponding to the elements in a rectilinear, n-dimension matrix. Each value can be referenced by a unique index.

Association ID	Text

The resource identifier for a resource with which this resource is closely associated.

Asteroid	Item

A small extraterrestrial body consisting mostly of rock and metal that is in orbit around the sun.

Atmosphere	Item

The neutral gases surrounding a body that extends from the surface and is bound to the body by virtue of the gravitational attraction.

Atomic Number	Numeric

The the number of protons in the nucleus of an atom.

Aurora	Item

An atmospheric phenomenon consisting of bands of light caused by charged solar particles following the earth's magnetic lines of force.

Auroral Region	Item

The region in the atmospheric where electrically-charged particles bombarding the upper atmosphere of a planet in the presence of a magnetic field produce an opitcal phenomenum.

Availability	Enumeration

An indication of the method or service which may be used to access the resource.
> Allowed Values:
>> Offline
>> Online

Average	Item

The statistical mean; the sum of a set of values divided by the number of values in the set.

Average Charge State	Item

A measure of the composite deficit (positive) or excess (negative) of electrons with respect to protons.

Azimuthal Angle	Item

The horizontal angular distance from a reference direction. For a vector (X,Y,Z) in any coordinate system, the azimuthal angle is arctan(Y/X).

Azimuthal Angle Range	Container

The range of possible azimuthal angles for a group of energy observations. Default units are degrees.

Sub-elements:
       Bin
       High
       Low
       Units

BZIP2	Item

An open standard algorithm by Julian Seward using Burrows-Wheeler block sorting and Huffman coding. See <http://www.bzip.org/>

Band Name	Text

A common or provider assigned name for a range of values.

Base64	Item

A data encoding scheme whereby binary-encoded data is converted to printable ASCII characters. It is defined as a MIME content transfer encoding for use in internet e-mail. The only characters used are the upper- and lower-case Roman alphabet characters (A–Z, a–z), the numerals (0–9), and the "+" and "/" symbols, with the "=" symbol as a special suffix (padding) code.

Bin	Container

A grouping of observations according to a band or window of a common attribute.
Sub-elements:
       Band Name
       High
       Low

Binary	Item

A direct representation of the bits which may be stored in memory on a computer.

Bow Shock Crossing	Item

A crossing of the boundary between the undisturbed (except for foreshock effects) solar wind and the shocked, decelerated solar wind of the magnetosheath.

Bytes	Numeric

The number of bytes expressed as a fractional number in the associated units.

CDF	Item

Common Data Format (CDF). A binary storage format developed at Goddard Space Flight Center (GSFC).

CEF	Item

Cluster Exchange Format (CEF) is a self-documenting ASCII format designed for the exchange of data. There are two versions of CEF which are not totally compatible.

CEF 1	Item

Cluster Exchange Format (CEF), version 1, is a self-documenting ASCII format designed for the exchange of data. The metadata contains information compatible with the ISTP recommendations for CDF.

CEF 2	Item

Cluster Exchange Format (CEF), version 2, is a self-documenting ASCII format designed for the exchange of data and introduced for Cluster Active Archive. Compared to version 1, the metadata description of vectors and tensors is different.

CGM	Item

Corrected Geomagnetic - A coordinate system from a spatial point with GEO radial distance and geomagnetic latitude and longitude, follow the epoch-appropriate IGRF/DGRF model field vector through to the point where the field line crosses the geomagnetic dipole equatorial plane. Then trace the dipole magnetic field vector Earthward from that point on the equatorial plane, in the same hemisphere as the original point, until the initial radial distance is reached.

Designate the dipole latitude and longitude at that point as the CGM latitude and longitude of the original point. See <http://nssdc.gsfc.nasa.gov/space/cgm/cgmm_des.html>

Ca-K	Item

A spectrum with a wavelength of range centered near 393.5 nm. VSO nickname: Ca-K image with range of 391.9 nm to 395.2 nm.

Cadence	Duration

The time interval between the start of successive measurements.

Calibrated	Item

Data wherein sensor outputs have been convolved with instrument response function, often irreversibly, to yield physical parameter values.

Carrington	Item

A coordinate system which is centered at the Sun and is "fixed" with repsect to the synodic rotation rate; the mean synodic value is about 27.2753 days. The Astronomical Almanac gives a value for Carrington longitude of 349.03 degrees at 0000 UT on 1 January 1995.

Cartesian	Item

A coordinate system in which the position of a point is determined by its distance from two or three mutually perpendicular axes.

Catalog	Container

A tabular listing of events or observational notes, especially those that have utility in aiding a user in locating data. Catalogues include lists of events, files in a product, and data availability.
>   Sub-elements:
>>   Access Information
>>   Caveats
>>   Extension
>>   Input Resource ID
>>   Instrument ID
>>   Keyword
>>   Phenomenon Type
>>   Physical Parameter
>>   Provider Resource Name
>>   Provider Version
>>   Resource Header
>>   Resource ID
>>   Time Span

Caveats	Text

Information which may be important in the avoidance of misuse of the resource. This includes things such as instrument maladies, corruption or contamination.

Channeltron	Item

An instrument that detects electrons, ions, and UV-radiation, according to the principle of a secondary emission multiplier. It is typically used in electron spectroscopy and mass spectrometry.

Characteristic	Item

A quanity which can be easily identified and measured in a given environment.

Charged Particle Flux	Item

Measurements of fluxes of charged or ionized particles at above thermal energies, including relativistic particles of solar and galactic origin. May give simple fluxes, but more complete distributions are sometimes possible. Composition measurements may also be made.

Checksum	Container

A computed value that is dependent upon the contents of a digital data object. Primarily used to check whether errors or alterations have occurred during the transmission or storage of a data

object.
> Sub-elements:
>> Hash Function
>> Hash Value

Chromosphere — Item

The region of the Sun's (or a star's) atmosphere above the temperature minimum and below the Transition Region. The solar chromosphere is approximately 400 km to 2100 km above the photosphere, and characterized by temperatures from 4500 - 28000 K.

Circular — Item

Relative to polarization, right-hand circularly polarized light is defined such that the electric field is rotating clockwise as seen by an observer towards whom the wave is moving. Left-hand circularly polarized light is defined such that the electric field is rotating counterclockwise as seen by an observer towards whom the wave is moving. The polarization of magnetohydrodynamic waves is specified with respect to the ambient mean magnetic field : right-hand polarized waves have a transverse electric field component which turns in a right-handed sense (that of the gyrating electrons) around the magnetic field.

Co-Investigator — Item

An individual who is a scientific peer and major participant for an investigation.

Comet — Item

A relatively small extraterrestrial body consisting of a frozen mass that travels around the sun in a highly elliptical orbit.

Component — Enumeration

A part of a multi-part entity, e.g., the components of a vector.
> Allowed Values:
>> Phi
>> R
>> Theta
>> X
>> Y
>> Z

Contact — Container

The person or organization who may be able to provide special assistance or serve as a channel for communication for additional information about a resource.
> Sub-elements:
>> Person ID
>> Role

Contributor — Item

An entity responsible for making contributions to the content of the resource.

Coordinate Representation — Enumeration

The method or form for specifying a given point in a given coordinate system
> Allowed Values:
>> Cartesian
>> Cylindrical
>> Spherical

Coordinate System — Container

Specification of the origin and orientation of axes against which the location of some point is given and the representative form of each point.
> Sub-elements:
>> Coordinate Representation
>> Coordinate System Name

Coordinate System Name — Enumeration

Identifies the coordinate system in which the position, direction or observation has been expressed.

Allowed Values:

CGM
Carrington
DM
GEI
GEO
GSE
GSEQ
GSM
HAE
HCI
HEE
HEEQ
HG
HGI
J2000
LGM
MAG
MFA
RTN
SC
SE
SM
SR
SR2
SSE
Spacecraft Orbit Plane
WGS84

Corona	Item

The outermost atmospheric region of the Sun or a star, characterized by ionization temperatures above 10^5 K. The solar corona starts at about 2100 km above the photosphere; there is no generally defined upper limit.

Coronal Hole	Item

An extended region of the corona, exceptionally low in density and associated with unipolar photospheric regions. A coronal hole can be an "open" magnetic field in the corona and (perhaps) inner heliosphere which has a faster than average outflow (wind); A region of lower than "quiet" ion and electron density in the corona; or a region of lower peak electron temperature in the corona than in the "quiet" corona.

Coronal Mass Ejection	Item

A solar event which involves a burst of plasma which is ejected from the Sun into the interplanetary medium.

Coronograph	Item

An instrument which can image things very close to the Sun by using a disk to block the Sun's bright surface which reveals the faint solar corona and other celetrial objects.

Counts	Item

An enumeration of the number of detection events occurring in a particle detector per unit time or over detector accumulation times.

Cross Spectrum	Item

The Fourier transform of the cross correlation of two physical or empirical observations.

Current	Item

The flow of electrons through a conductor caused by a potential difference.

Cylindrical	Item

A system of curvilinear coordinates in which the position of a point in space is determined by its perpendicular distance from a given line, its distance from a selected reference plane perpendicular to this line, and its angular distance from a selected reference line when projected onto this plane.

D-Region	Item

The layer of the ionosphere that exists approximately 50 to 95 km above the surface of the Earth. One of several layers in the ionosphere.

DM	Item

Dipole Meridian - A coordinate system centered at the observation point. Z axis is parallel to the Earth's dipole axis, positive northward. X is in the plane defined by Z and the line linking the observation point with the Earth's center. Y is positive eastward. See <http://cdpp.cnes.fr/00428.pdf>

Data Extent	Container

The area of storage in a file system required to store the contents of a resource. The data extent is expressed in unitized bytes.
> Sub-elements:
>> Per
>> Quantity
>> Units

Data Producer	Item

An individual who generated the resource and is familiar with its provenance.

Dayside	Item

Sunward of a dawn-dusk meridian, either on the surface of, or above, some reference body.

Deputy-PI	Item

An individual who is an administrative or scientific leader for an investigation operting under the supervision of a Princial Investigator.

Description	Text

A detailed description of the resource which should include discussions of the main quantities in the resource, possible uses and search terms. A description should also include whether any corrections (i.e, geometry, inertial) have been applied to it.

Deviation	Item

The difference between an observed value and the expected value of a quantity.

Differential	Item

A flux measurement within a given energy and solid-angle range.

Display Cadence	Duration

The time interval between the successive display elements.

Display Data	Container

A graphical representation of data wherein the underlying numeric values are not (readily) accessible for analysis.. Examples are line plots and spectrograms.
> Sub-elements:
>> Access Information
>> Caveats
>> Display Cadence
>> Extension
>> Input Resource ID
>> Instrument ID
>> Keyword
>> Measurement Type
>> Observed Region
>> Physical Parameter

          Processing Level
          Provider Processing Level
          Provider Resource Name
          Provider Version
          Resource Header
          Resource ID
          Spectral Range
          Temporal Description

Document	Container

A set of information designed and presented as an individual entity. A document may contain plain or formatted text, inlined graphics, sound, other multimedia data, or hypermedia references. Some examples of documents include a paper, letter, book, user guide, map, drawing, photograph, or image.
          Sub-elements:
                    Access Information
                    Document Type
                    Input Resource ID
                    Keyword
                    Resource Header
                    Resource ID

Document Type	Enumeration

A characterization of the content or purpose of a document.
          Allowed Values:
                    Paper

Dopplergram	Item

A map or image depicting the spatial distribution of line-of-sight velocities of the observed object.

Double Sphere	Item

A dipole antenna of which the active (sensor) elements are small spheres located at the ends of two wires deployed in the equatorial plane, on opposite sides of a spinning spacecraft.

Dust	Item

Free microscopic particles of solid material.

E-Region	Item

A layer of ionised gas occurring at 90-150km above the ground. One of several layers in the ionosphere. Also called the The Kennelly-Heaviside layer.

EIT Wave	Item

A wave in the corona of the Sun which produce shock waves on the Sun's chromosphere (Moreton Waves). EIT Waves are produced by large solar flare and expand outward at about 1,000 km/s. It usually appears as a slowly moving diffuse arc of brightening in H-alpha, and may travel for several hundred thousand km.

Earth	Enumeration

The third planet from the sun in our solar system.
          Allowed Values:
                    Magnetosheath
                    Magnetosphere
                    Magnetosphere.Magnetotail
                    Magnetosphere.Main
                    Magnetosphere.Polar
                    Magnetosphere.Radiation Belt
                    Near Surface
                    Near Surface.Atmosphere
                    Near Surface.Auroral Region
                    Near Surface.Equatorial Region
                    Near Surface.Ionosphere

Near Surface.Ionosphere.D-Region
Near Surface.Ionosphere.E-Region
Near Surface.Ionosphere.F-Region
Near Surface.Ionosphere.Topside
Near Surface.Mesosphere
Near Surface.Plasmasphere
Near Surface.Polar Cap
Near Surface.South Atlantic Anomaly Region
Near Surface.Stratosphere
Near Surface.Thermosphere
Near Surface.Troposphere
Surface

Electric	Item

The physical attribute that exerts an electrical force.

Electric Field	Item

Measurements of electric field vectors (sometimes not all components) as a time series.

Electric Field Instrument	Enumeration

An intrument which measuree electric field properties.

Electromagnetic	Item

The physical attribute that is or is caused by a mutual interaction of electric and magnetic fields.

Electron	Item

An elementary particle consisting of a charge of negative electricity equal to about 1.602 x 10**(-19) Coulomb and having a mass when at rest of about 9.109534 x 10**(-28) gram.

Electron Drift Instrument	Item

An active experiment to measure the electron drift velocity based on sensing the displacement of a weak beam of electrons after one gyration in the ambient magnetic field.

Electrostatic Analyser	Item

An instrument which uses charged plates to analyze the mass, charge and kinetic energies of charged particles which enter the instrument.

Element	Container

A component or indiviual unit of a multiple value quantity such as an array or vector.
　　　Sub-elements:
　　　　　　Component
　　　　　　FillValue
　　　　　　Index
　　　　　　Name
　　　　　　Parameter Key
　　　　　　Units
　　　　　　Units Conversion
　　　　　　ValidMax
　　　　　　ValidMin

Elevation	Numeric

The distance in meters above (positive) or below (negative) the "zero elevation" defined by the World Geodetic System reference frame (WGS84).

Email	Text

The electronic address at which the individual may be contacted expressed in the form "local-part@domain".

Emissivity	Item

The ratio of radiant energy from a material to that from a blackbody at the same kinetic temperature

Encoding   Enumeration

A set of unambiguous rules that establishes the representation of information within a file.
Allowed Values:
> ASCII
> BZIP2
> Base64
> GZIP
> None
> TAR
> Unicode
> ZIP

Energetic Particle Instrument   Enumeration

An instrument that measures fluxes of charged particles as a function of time, direction of motion, mass, charge and/or species.

Energetic Particles   Item

Pieces of matter that are moving very fast. Energetic particles include protons, electrons, neutrons, neutrinos, the nuclei of atoms, and other sub-atomic particles.

Energetic Solar Particle Event   Item

An enhancement of interplanetary fluxes of energetic ions accelerated by interplanetary shocks and/or solar flares.

Energy   Item

The capacity for doing work as measured by the capability of doing work (potential energy) or the conversion of this capability to motion (kinetic energy)

Energy Density   Item

The amount of energy per unit volume.

Energy Flux   Item

The amount of energy passing through a unit area in a unit time.

Energy Range   Container

The minimum and maximum energy values of the particles represented by a given "physical parameter" description.
Sub-elements:
> Bin
> High
> Low
> Spectral Range
> Units

Ephemeris   Item

The spatial coordinates of a body as a function of time. When used as an Instrument Type it represents the process or methods used to generate spatial coordinates.

Equatorial Region   Item

A region centered on the equator and limited in latitude by approximately 23 degrees north and south of the equator.

Equivalent Width   Item

The area of the spectral line profile divided by the peak height or depth.

Expiration Date   DateTime

The date and time when a resource is no longer available. If the Expiration Date is specified then it indicates that resource should not be made available after that time. However, this is only advisory and in practice a resource description should be unpublished to eliminate access to a resource.

Exposure   Duration

The time interval over which an individual measurement is taken.

Extension   Container

A container of other metadata which is not part of the SPASE data model. The contents of this element are defined by individual usage. The organization and content are constrained by the implementation. For example, in an XML representation of the SPASE metadata the content must conform to the XML specications.

Extreme Ultraviolet   Item

A spectrum with a wavelength range of 10.0 nm to 125.0nm. VSO nickname: EUV image with a range of of 10.0 nm to 125.0 nm

F-Region   Item

A layer that contains ionized gases at a height of around 150–800 km above sea level, placing it in the thermosphere. the F region has the highest concentration of free electrons and ions anywhere in the atmosphere. It may be thought of as comprising two layers, the F1-and F2-layers. One of several layers in the ionosphere. Also known as the Appleton layer.

FITS   Item

Flexible Image Transport System (FITS) is a digital format primarily designed to store scientific data sets consisting of multi-dimensional arrays (1-D spectra, 2-D images or 3-D data cubes) and 2-dimensional tables containing rows and columns of data.

Faraday Cup   Item

An instrument consisting of an electrode from which electrical current is measured while a charged particle beam (electrons or ions) impinges on it. Used to determine energy spectrum and sometimes ion composition of the impinging particles.

Fax Number   Text

The symbols and numerals required to send a facsimile (FAX) to an individual by telephone. The string may contain punctuation marks such as dash (-) or dot (.) to separate fields within the string.

Field   Container

The space around a radiating body within which its electromagnetic attributes can exert force on another similar body that is not in direct contact.
> Sub-elements:
>> Field Qualifier
>> Field Quantity
>> Frequency Range

Field Qualifier   Enumeration

Characterizes the directional and statistical aspects of the field observation.
> Allowed Values:
>> Average
>> Component
>> Component.Phi
>> Component.R
>> Component.Theta
>> Component.X
>> Component.Y
>> Component.Z
>> Cross Spectrum
>> Deviation
>> Magnitude
>> Parallel
>> Peak
>> Perpendicular
>> Phase Angle
>> Scalar

Standard Deviation
Tensor
Uncertainty
Variance
Vector

Field Quantity	Enumeration

The physical attribute of the field.
Allowed Values:
Current
Electric
Electromagnetic
Gyrofrequency
Magnetic
Plasmafrequency
Potential
Poynting Flux

FillValue	Text

A value that indidicates that a qunatity is undefined.

Fit	Item

Values that make an model agree with the data.

Flow Speed	Item

The rate at which particles or energy is passing through a unit area in a unit time.

Flux Feedback	Item

A search coil whose bandwidth and signal/noise ratio are increased by the application of negative feedback at the sensor (flux) level by driving a collocated coil with a signal from the preamplifier.

Forbush Decrease	Item

A rapid decrease in the observed galactic cosmic ray intensity following the passage of an outwardly convecting interplanetary magnetic field disturbance, such as those associated with large CME's, that sweep some galactic cosmic rays away from Earth.

Format	Enumeration

The organization of data according to preset specifications. The value is selected from a list of accepted names for known, well documented formats.
Allowed Values:
AVI
Binary
CDF
CEF
CEF 1
CEF 2
FITS
GIF
HDF
HDF 4
HDF 5
HTML
IDFS
IDL
JPEG
MATLAB_4
MATLAB_6
MATLAB_7
MPEG
NCAR
NetCDF

PDF
PNG
Postscript
QuickTime
TIFF
Text
UDF
VOTable
XML

Fourier Transform Spectrograph   Item

An instrument that determines the spectra of a radiative source, using time-domain measurements and a Fourier transform.

Frequency   Item

(1) The number of occurrences within a given time period. (2) Vibrations per second of the photon field; may be given as a single number, multiple numbers, or as ranges.

Frequency Range   Container

The range of possible values for the observed frequency.
Sub-elements:
Bin
High
Low
Spectral Range
Units

GEI   Item

Geocentric Equatorial Inertial - A coordinate system where the Z axis is along Earth's spin vector, positive northward. X axis points towards the first point of Aries (from the Earth towards the Sun at the vernal equinox). See Russell, 1971

GEO   Item

Geographic - geocentric corotating - A coordinate system where the Z axis is along Earth's spin vector, positive northward. X axis lies in Greenwich meridian, positive towards Greenwich. See Russell, 1971.

GIF   Item

Graphic Interchange Format (GIF) first introduced in 1987 by CompuServe. GIF uses LZW compression and images are limited to 256 colours.

GSE   Item

Geocentric Solar Ecliptic - A coordinate system where the X axis is from Earth to Sun. Z axis is normal to the ecliptic, positive northward. See Russell, 1971.

GSEQ   Item

Geocentric Solar Equatorial - A coordinate system where the X axis is from Earth to Sun. Y axis is parallel to solar equatorial plane. Z axis is positive northward. See Russell, 1971

GSM   Item

Geocentric Solar Magnetospheric - A coordinate system where the X axis is from Earth to Sun, Z axis is northward in a plane containing the X axis and the geomagnetic dipole axis. See Russell, 1971

GZIP   Item

An open standard algorithm distributed by GHU based on LZ77 and Huffman coding. See <http://www.gnu.org/software/gzip/gzip.html> or <http://www.gzip.org/>

Gamma Rays   Item

Photons with a wavelength range: 0.00001 to 0.001 nm

Geiger-Mueller Tube	Item

An instrument which measures density of ionizing radiation based on interactions with a gas.

General Contact	Item

An individual who can provide information on a range of subjects or who can direct you to a domain expert.

Geomagnetic Storm	Item

A magnetospheric disturbance typically defined by variations in the horizontal component of the Earth's surface magnetic field. The variation typically starts with a field enhancement associated with a solar wind pressure pulse and continues with a field depression associated with an enhancement of the diamagnetic magnetospheric ring current.

Granule	Container

An accessible portion of another resource. A Granule may be composed of one or more physical pieces (files) which are considered inseperable. For example, a data storage format that maintains metadata and binary data in seperate, but tightly coupled files. Granules should not be used to group files that have simple relationships or which are associated through a parent resource. For example, each file containing a time interval data for a Numerical Data resource would each be considered a Granule. The ParentID of a Granule resource must be a NumericalData resource. The attributes of a Granule supersede the corresponding attributes in the NumericalData resource.

    Sub-elements:
>> Checksum
>> Data Extent
>> Expiration Date
>> Extension
>> Parent ID
>> Prior ID
>> Release Date
>> Resource ID
>> Start Date
>> Stop Date
>> URL

Gyrofrequency	Item

The frequency with which a charged particle (as an electron) executes spiral gyrations in moving obliquely across a magnetic field

H-alpha	Item

A spectrum with a wavelength range centered at 656.3 nm. VSO nickname: H-alpha image with a spectrum range of of 655.8 nm to 656.8 nm.

HAE	Item

Heliocentric Aries Ecliptic - A coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis is positive towards the first point of Aries (from Earth to Sun at vernal equinox). Same as SE below. See Hapgood, 1992.

HCI	Item

Heliographic Carrington Inertial.

HDF	Item

Hierarchical Data Format

HDF 4	Item

Hierarchical Data Format, Version 4

HDF 5	Item

Hierarchical Data Format, Version 5

HEE	Item

Heliocentric Earth Ecliptic - A coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis points from Sun to Earth. See Hapgood, 1992

| HEEQ | Item |

Heliocentric Earth Equatorial - A coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X axis is generally Earthward in the plane defined by the Z axis and the Sun-Earth direction. See Hapgood, 1992.

| HG | Item |

Heliographic - A heliocentric rotating coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X, Y axes rotate with a 25.38 day period. The zero longitude (X axis) is defined as the longitude that passed through the ascending node of the solar equator on the ecliptic plane on 1 January, 1854 at 12 UT. See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>

| HGI | Item |

Heliographic Inertial - A heliocentric coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X axis is along the intersection line between solar equatorial and ecliptic planes. The X axis was positive at SE longitude of 74.367 deg on Jan 1, 1900. (See SE below.) See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>

| HTML | Item |

A text file containing structured information represented in the HyperText Mark-up Language (HTML). See <http://www.w3.org/MarkUp/>

| Hard X-rays | Item |

Photons with a wavelength range: 0.001 to 0.1 nm

| Hash Function | Enumeration |

A function or algorithm that converts a digital data object into a hash value. Typically the hash value is small and concise when compared to the digital data object.
Allowed Values:
MD5
SHA1
SHA256

| Hash Value | Text |

The value calculated by a hash function, e.g. the message digest of a digital data object.

| He-10830 | Item |

A spectrum with a wavelength range centered at 1082.9 nm. VSO nickname: He 10830 image with a range of 1082.5 nm to 1083.3 nm.

| Heat Flux | Item |

Flow of thermal energy through a gas or plasma; typically computed as third moment of a distribution function.

| Heliosphere | Enumeration |

The solar atmosphere extending roughly from the outer corona to the edge of the solar plasma at the heliopause separating primarily solar plasma from interstellar plasma.
Allowed Values:
Inner
Near Earth
Outer
Remote 1AU

| High | Numeric |

The largest value within a range of possible values.

| High Latitude | Item |

The region located poleward of 60 degrees of latitude.

IDFS	Item

Instrument Data File Set (IDFS) is a set of files written in a prescribed format which contain data, timing data, and meta-data. IDFS was developed at Southwest Research Institute (SwRI).

IDL	Item

Interactive Data Language (IDL) save set. IDL is a proprietary format.

Image Intensity	Item

Measurements of the two-dimensional distribution of the intensity of photons from some region or object such as the Sun or the polar auroral regions; can be in any wavelength band, and polarized, etc.

Imager	Enumeration

An instrument which samples the radiation from an area at one or more spectral ranges emitted or reflected by an object.

Imaging Spectrometer	Item

An instrument which is a multispectral scanner with a very large number of channels (64-256 channels) with very narrow band widths.

Index	Sequence

The location of an item in an array or vetor. An index can be multivalued to represent the location in a multidimensional object.

Information URL	Container

Attributes of the method of acquiring additional information.
      Sub-elements:
            Description
            Name
            URL

Infrared	Item

Photons with a wavelength range: 760 to 1.00x10^6 nm

Inner	Item

The region of the heliosphere extending radially out from the "surface" of the Sun to 1 AU.

Input Resource ID	Text

The resource identifier for a resource which was used to generate this resource.

Instrument	Container

A device which is used to sense and parameterize a physical phenomenon.
      Sub-elements:
            Caveats
            Extension
            Instrument Type
            Investigation Name
            Observatory ID
            Resource Header
            Resource ID

Instrument ID	Text

The identifer of an Instrument resource.

Instrument Status	Item

A quantity directly related to the operation or function of an instrument.

Instrument Type	Enumeration

A characterization of an integrated collection of software and hardware containing one or more sensors and associated controls used to produce data on an environment.

Allowed Values:
> Antenna
> Channeltron
> Coronograph
> Double Sphere
> Electron Drift Instrument
> Electrostatic Analyser
> Energetic Particle Instrument
> Ephemeris
> Faraday Cup
> Flux Feedback
> Fourier Transform Spectrograph
> Geiger-Mueller Tube
> Imager
> Imaging Spectrometer
> Interferometer
> Langmuir Probe
> Long Wire
> Magnetometer
> Mass Spectrometer
> Microchannel Plate
> Multispectral Imager
> Neutral Atom Imager
> Particle Correlator
> Particle Detector
> Photometer
> Photopolarimeter
> Proportional Counter
> Quadrispherical Analyser
> Radar
> Radiometer
> Resonance Sounder
> Retarding Potential Analyser
> Riometer
> Scintillation Detector
> Search Coil
> Sounder
> Spacecraft Potential Control
> Spectral Power Receiver
> Spectrometer
> Time-of-flight
> Unspecified
> Waveform Receiver

Integral	Item

The summation of values above a given threshold and over area or solid-angle range.

Interferometer	Item

An instrument which measures the difference between two or more waves.

Interior	Item

The region inside the body which is not visible from outside the body.

Interplanetary Shock	Item

A shock propagating generally antisunward through the slower solar wind, often seen in front of CME-associated plasma clouds.

Investigation Name	Text

The name given to the contract or engagement which enabled the data to be produced. Each investigation is associated with a Principal Investigator or Guest Investigator who was responsible for the original proposal. For single PI missions each major subsystem having its own identified Team Leader may also be classed as an "Investigation" for the purposes of data

archiving.

Ion	Item

An atom that has acquired a net electric charge by gaining or losing one or more electrons.(Note: Z>2)

Ion Composition	Item

In situ measurements of the relative flux or density of electrically charged particles in the space environment. May give simple fluxes, but full distribution functions are sometimes measured.

Ionosphere	Enumeration

The charged or ionized gases surrounding a body that are nominally bound to the body by virtue of the gravitational attraction..

Irradiance	Item

A radiometric term for the power of electromagnetic radiation at a surface, per unit area. "Irradiance" is used when the electromagnetic radiation is incident on the surface. The SI unit of irradiance is watts per square meter (W·m-2).

J2000	Item

An astronomical coordinate system which uses the mean equator and equinox of Julian date 2451545.0 TT (Terrestrial Time), or January 1, 2000, noon TT. (aka J2000) to define a celestial reference frame.

JPEG	Item

A binary format for still images defined by the Joint Photographic Experts Group

Jupiter	Item

The fifth planet from the sun in our solar system.

K-7699	Item

A spectrum with a wavelength range centerd at 769.9 nm. VSO nickname: K-7699 dopplergram with a range of 769.8 nm to 770.0 nm.

Keyword	Text

A word or phrase that is relevant to the resource but does not exist in other documentary information.

LGM	Item

Local Geomagnetic - A coordinate system used mainly for Earth surface or near Earth surface magnetic field data. X axis northward from observation point in a geographic meridian. Z axis downward towards Earth's center. In this system, H (total horizontal component) = SQRT (Bx**2 + By**2) and D (declination angle) = arctan (By/Bx)

Langmuir Probe	Item

A monopole antenna associated with an instrument. The instrument applies a potential to the antenna which is swept to determine the voltage/current characteristic. This provides information about the plasma surrounding the probe and spacecraft.

Language	Text

The two character indicator of language selected from the ISO 630-1 codes for the representation of names of languages.

Latitude	Numeric

The location of a place on Earth specified as an angle east (positive) or west (negative) of a north-south line called the Prime Meridian defined by the coordinate system in use.

Line Depth	Item

In spectra, a measure of the amount of absorption for a particular wavelength or frequency in the spectrum

Line of Sight	Item

The line of sight is the line that connects the observer with the observed object. This expression is often used with measurements of Doppler velocity and magnetic field in magnetograms, where only the component of the vector field directed along the line of sight is measured.

Linear	Item

Relative to polarization, confinement of the E-field vector to a given plane

Location	Container

A position in space definable by a regional referencing system and geographic coordinates.
> Sub-elements:
>> Coordinate System Name
>> Elevation
>> Latitude
>> Longitude
>> Observatory Region

Long Wire	Item

A dipole antenna whose active (sensor) elements are two wires deployed in the equatorial plane on opposite sides of a spinning spacecraft, and whose length is several times greater than the spacecraft diameter.

Longitude	Numeric

The location of a place on Earth specified as an angle north (positive) or south (negative) of the equator defined by the coordinate system in use.

Low	Numeric

The smallest value within a range of possible values.

Low Latitude	Item

The region located at or anti-poleward of 60 degrees of latitude.

MAG	Item

Geomagnetic - geocentric. Z axis is parallel to the geomagnetic dipole axis, positive north. X is in the plane defined by the Z axis and the Earth's rotation axis. If N is a unit vector from the Earth's center to the north geographic pole, the signs of the X and Y axes are given by Y = N x Z, X = Y x Z.. See Russell, 1971, and <http://cdpp.cnes.fr/00428.pdf>

MATLAB_4	Item

MATLAB Workspace save set, version 4. MAT-files are double-precision, binary, MATLAB format files. MATLAB is a proprietary product of The MathWorks.

MATLAB_6	Item

MATLAB Workspace save set, version 6. MAT-files are double-precision, binary, MATLAB format files. MATLAB is a proprietary product of The MathWorks.

MATLAB_7	Item

MATLAB Workspace save set, version 7. MAT-files are double-precision, binary, MATLAB format files. Version 7 includes data compression and Unicode encoding. MATLAB is a proprietary product of The MathWorks.

MD5	Item

Message Digest 5 (MD5) is a 128-bit message digest algorithm created in 1991 by Professor Ronald Rivest.

MFA	Item

Magnetic Field Aligned - A coordinate system spacecraft-centered system with Z in the direction of the ambient magnetic field vector. X is in the plane defined by Z and the spacecraft-Sun line, positive sunward. See <http://cdpp.cnes.fr/00428.pdf>

MPEG	Item

A digital format for movies defined by the Motion Picture Experts Group

Magnetic	Item

The physical attribute attributed to a magnet or its equivalent.

Magnetic Cloud	Item

A transient event observed in the solar wind characterized as a region of enhanced magnetic field strength, smooth rotation of the magnetic field vector and low proton density and temperature.

Magnetic Field	Item

Measurements of magnetic field vectors (sometimes not all components) as time series; can be space- or ground-based. Also, [Zeeman splitting, etc. based]: A region of space near a magnetized body where magnetic forces can be detected [as measured by methods such as Zeeman splitting, etc.]

Magnetogram	Item

Measurements of the vector or line-of-sight magnetic field determined from remote sensing measurements of the detailed structure of spectral lines, including their splitting and polarization. ("Magnetogram.")

Magnetometer	Enumeration

An instrument which measures the ambient magnetic field.

Magnetopause Crossing	Item

A crossing of the interface between the shocked solar wind in the magnetosheath and the magnetic field and plasma in the magnetosphere.

Magnetosheath	Item

The region between the bow shock and the magnetopause, characterized by very turbulent plasma.

Magnetosphere	Enumeration

The region of space above the atmosphere or surface of the planet, and bounded by the magnetopause, that is under the direct influence of the planet's magnetic field.
> Allowed Values:
>> Magnetotail
>> Main
>> Polar
>> Radiation Belt

Magnetotail	Item

The region on the night side of the body where the magnetic filed is stretched backwards by the force of the solar wind. For Earth, the magnetotail begins at a night-side radial distance of 10 Re (X > -10Re).

Magnitude	Item

A measure of the strength or size of a vector quantity.

Main	Item

The region of the magnetosphere where the magnetic field lines are closed, but does not include the gaseous region gravitationally bound to the body.

Mars	Item

The forth planet from the sun in our solar system.

Mass	Item

The measure of inertia (mass) of individual objects (e.g., aerosols).

Mass Density	Item

The mass of particles per unit volume.

Mass Spectrometer	Item

An instrument which distinguishes chemical species in terms of their different isotopic masses.

Measured	Container

Attributes of observations obtained from an instrument or sensor.
> Sub-elements:
>> Field
>> Mixed
>> Particle
>> Photon

Measurement Type	Enumeration

A characterization of the quantitative assessment of a phenomenon.
> Allowed Values:
>> Activity Index
>> Charged Particle Flux
>> Dopplergram
>> Electric Field
>> Energetic Particles
>> Ephemeris
>> Image Intensity
>> Instrument Status
>> Ion Composition
>> Irradiance
>> Magnetic Field
>> Magnetogram
>> Neutral Atom Images
>> Neutral Gas
>> Profile
>> Radiance
>> Radio Soundings
>> Radio and Plasma Waves
>> Spectrum
>> Thermal Plasma

Mercury	Item

The first planet from the sun in our solar system.

Mesosphere	Item

The layer of the atmosphere that extends from the Stratosphere to a range of 80 km to 85 km, temperature decreasing with height.

Metadata Contact	Item

An individual who can affect a change in the metadata describing a resource.

Microchannel Plate	Item

An instrument used for the detection of elementary particles, ions, ultraviolet rays and soft X-rays constructed from very thin conductive glass capillaries.

Microwave	Item

Photons with a wavelength range: 1.00×10^6 to 1.50×10^7 nm

Mixed	Text

A measured observation which is derived from a combination of two or more individual measurements.

Mode Amplitude	Item

In helioseismology the magnitude of oscillation of waves of a particular geometry.

Molecule	Item

A group of atoms so united and combined by chemical affinity that they form a complete, integrated whole, being the smallest portion of any particular compound that can exist in a free state

Moment	Item

Parameters determined by integration over a distribution function convolved with a power of velocity.

Multispectral Imager	Item

An instrument which captures images at multiple spectral ranges.

NCAR	Item

The National Center for Atmospheric Research (NCAR) format. A complete description of that standard is given in appendix C of the "Report on Establishment & Operation of the Incoherent-Scatter Data Base", dated August 23, 1984, obtainable from NCAR, P.O. Box 3000 Boulder, Colorado 80307-3000.

Na-D	Item

A spectrum with a wavelength range of centered at 589.3 nm. VSO nickname: Na-D image with a range of 588.8 nm to 589.8 nm.

Name	Text

A language unit by which a person or thing is known.

Near Earth	Item

The heliospheric region near the Earth which extends to and includes the area near the L1 and L2 Lagrange point.

Near Surface	Enumeration

The gaseous and possibly ionized environment of a body extending from the surface to some specified altitude. For the Earth, this altitude is 2000 km.

Allowed Values:

> Atmosphere
> Auroral Region
> Equatorial Region
> Ionosphere
> Ionosphere.D-Region
> Ionosphere.E-Region
> Ionosphere.F-Region
> Ionosphere.Topside
> Mesosphere
> Plasmasphere
> Polar Cap
> South Atlantic Anomaly Region
> Stratosphere
> Thermosphere
> Troposphere

Neptune	Item

The seventh planet from the sun in our solar system.

NetCDF	Item

Unidata Program Center's Network Common Data Form (NetCDF). A self-describing data portable data format for array-oriented data access. See <http://my.unidata.ucar.edu/content/software/netcdf>

Neutral	Item

Either a particle, an object, or a system that has a net electric charge of zero

Neutral Atom Imager	Item

An instrument which measures the quantity and properties of neutral particles over a range of angles. Measured properties can include mass and energy.

| Neutral Atom Images | Item |

Measurements of neutral atom fluxes as a function of look direction; often related to remote energetic charged particles that lose their charge through charge-exchange and then reach the detector on a line.

| Neutral Gas | Item |

Measurements of neutral atomic and molecular components of a gas.

| Neutral Particle Detector | Item |

An instrument which measures the quantity and properties of neutral particles. Measured properties can include mass and plasma bulk densities.

| Ni-6768 | Item |

A spectrum with a wavelength range centered at 676.8 nm. VSO nickname: Ni-6768 dopplergram with a range of of 676.7 nm to 676.9 nm.

| Nightside | Item |

Anti-Sunward of a dawn-dusk meridian, either on the surface of, or above, some reference body.

| None | Item |

A lack or absence of anything.

| Note | Text |

Information which is useful or important for the understanding of a value or parameter.

| Number Density | Item |

The number of particles per unit volume.

| Number Flux | Item |

The number of particles passing through a unit area in a unit time.

| Numerical Data | Container |

Data stored as numerical values in a specified format.
> Sub-elements:
>> Access Information
>> Caveats
>> Extension
>> Input Resource ID
>> Instrument ID
>> Keyword
>> Measurement Type
>> Observed Region
>> Physical Parameter
>> Processing Level
>> Provider Processing Level
>> Provider Resource Name
>> Provider Version
>> Resource Header
>> Resource ID
>> Spectral Range
>> Temporal Description

| Observatory | Container |

The host (spacecraft, network, facility) for instruments making observations.
> Sub-elements:
>> Extension
>> Location

Observatory Group
Resource Header
Resource ID

Observatory Group   Text

A set of programmatically related observatories. The value is taken from an approved list of observatory group names.

Observatory ID   Text

The identifier of an Observatory resource.

Observatory Region   Enumeration

A spatial location distinguished by certain natural features or physical characteristics where an observatory is located.

Allowed Values:

Asteroid
Comet
Earth
Earth.Magnetosheath
Earth.Magnetosphere
Earth.Magnetosphere.Magnetotail
Earth.Magnetosphere.Main
Earth.Magnetosphere.Polar
Earth.Magnetosphere.Radiation Belt
Earth.Near Surface
Earth.Near Surface.Atmosphere
Earth.Near Surface.Auroral Region
Earth.Near Surface.Equatorial Region
Earth.Near Surface.Ionosphere
Earth.Near Surface.Ionosphere.D-Region
Earth.Near Surface.Ionosphere.E-Region
Earth.Near Surface.Ionosphere.F-Region
Earth.Near Surface.Ionosphere.Topside
Earth.Near Surface.Mesosphere
Earth.Near Surface.Plasmasphere
Earth.Near Surface.Polar Cap
Earth.Near Surface.South Atlantic Anomaly Region
Earth.Near Surface.Stratosphere
Earth.Near Surface.Thermosphere
Earth.Near Surface.Troposphere
Earth.Surface
Heliosphere
Heliosphere.Inner
Heliosphere.Near Earth
Heliosphere.Outer
Heliosphere.Remote 1AU
Jupiter
Mars
Mercury
Neptune
Pluto
Saturn
Sun
Sun.Chromosphere
Sun.Corona
Sun.Interior
Sun.Photosphere
Sun.Transition Region
Uranus
Venus

Observed Region   Enumeration

The portion of space measured by the instrument at the time of an observation. A region is

distinguished by certain natural features or physical characteristics. It is the location of the observatory for in situ data, the location or region sensed by remote sensing observatories and the location-of-relevance for parameters that are derived from observational data.

Allowed Values:

Asteroid
Comet
Earth
Earth.Magnetosheath
Earth.Magnetosphere
Earth.Magnetosphere.Magnetotail
Earth.Magnetosphere.Main
Earth.Magnetosphere.Polar
Earth.Magnetosphere.Radiation Belt
Earth.Near Surface
Earth.Near Surface.Atmosphere
Earth.Near Surface.Auroral Region
Earth.Near Surface.Equatorial Region
Earth.Near Surface.Ionosphere
Earth.Near Surface.Ionosphere.D-Region
Earth.Near Surface.Ionosphere.E-Region
Earth.Near Surface.Ionosphere.F-Region
Earth.Near Surface.Ionosphere.Topside
Earth.Near Surface.Mesosphere
Earth.Near Surface.Plasmasphere
Earth.Near Surface.Polar Cap
Earth.Near Surface.South Atlantic Anomaly Region
Earth.Near Surface.Stratosphere
Earth.Near Surface.Thermosphere
Earth.Near Surface.Troposphere
Earth.Surface
Heliosphere
Heliosphere.Inner
Heliosphere.Near Earth
Heliosphere.Outer
Heliosphere.Remote 1AU
Jupiter
Mars
Mercury
Neptune
Pluto
Saturn
Sun
Sun.Chromosphere
Sun.Corona
Sun.Interior
Sun.Photosphere
Sun.Transition Region
Uranus
Venus

Offline	Text

Not directly accessible electronically. This includes resources which may to be moved to an online status in response to a given request.

Sub-elements:
Medium

Online	Item

Directly accessible electronically.

Open	Item

Access is granted to everyone.

Optical	Item

Photons with a wavelength range: 380 to 760 nm

Organization Name	Text

A unit within a company or other entity (e.g., Government agency or branch of service) within which many projects are managed as a whole.

Other	Item

Values, such as flags, that are not time tags, location data or measured or derived parameters.

Outer	Item

The region of the heliosphere from, but not including, 1 AU to the farthest extent of the heliosphere (heliopause).

PDF	Item

A document expressed in the Portable Document Format (PDF) as defined by Adobe.

PNG	Item

A digital format for still images. Portable Network Graphics (PNG)

Paper	Item

A formal presentation of an idea or discovery typically more than a few pages in length.

Parallel	Item

Having the same direction as a given direction

Parameter Key	Text

The name or identfier which can be used to access the parameter in the resource. The associated value is dependent on the service used to access the resource.

Parent ID	Text

The resource identifier for a resource that a resource is a part of. The resource inherits the attributes of the referenced resource. Attributes defined in the resource override attributes of the parent in the manner perscribed by the containing resource.

Particle	Container

A description of the types of particles observed in the measurement. This includes both direct observations and inferred observations.
> Sub-elements:
>> Atomic Number
>> Azimuthal Angle Range
>> Energy Range
>> Particle Qualifier
>> Particle Quantity
>> Particle Type
>> Polar Angle Range

Particle Correlator	Item

An instrument which correlates particle flux to help identify wave/particle interactions.

Particle Qualifier	Enumeration

Characterizes the directional and statistical aspects of the particle observation.
> Allowed Values:
>> Anisotropy
>> Average
>> Characteristic
>> Component
>> Component.Phi
>> Component.R
>> Component.Theta
>> Component.X
>> Component.Y

Component.Z
Deviation
Differential
Fit
Integral
Magnitude
Moment
Parallel
Peak
Perpendicular
Ratio
Scalar
Standard Deviation
Tensor
Uncertainty
Variance
Vector

Particle Quantity — Enumeration

A characterization of the physical properties of the particle.
Allowed Values:
Alfven Mach Number
Average Charge State
Counts
Energy
Energy Density
Energy Flux
Flow Speed
Gyrofrequency
Heat Flux
Mass
Mass Density
Number Density
Number Flux
Phase-Space Density
Plasma Beta
Plasmafrequency
Pressure
Sonic Mach Number
Temperature
Thermal Speed
Velocity

Particle Type — Enumeration

A characterization of the kind of particle observed by the measurement.
Allowed Values:
Aerosol
Alpha Particle
Dust
Electron
Ion
Molecule
Neutral
Proton

Peak — Item

The maximum value for the quantity in question, over a period of time which is usually equal to the cadence.

Per — Duration

The time interval over which a characterization applies. For example, the number of bytes generated each day.

Perpendicular — Item
At right angles to a given direction.

Person — Container
An individual human being.
      Sub-elements:
            Address
            Email
            Extension
            Fax Number
            Organization Name
            Person Name
            Phone Number
            Release Date
            Resource ID

Person ID — Text
The identifier assigned to a Person description.

Person Name — Text
The words used to address an individual.

Phase Angle — Item
Phase difference between two or more waves, normally expressed in degrees.

Phase-Space Density — Item
The number of particles per unit volume in the six-dimensional space of position and velocity.

Phenomenon Type — Enumeration
The characteristics or categorization of an event type.
      Allowed Values:
            Active Region
            Aurora
            Bow Shock Crossing
            Coronal Hole
            Coronal Mass Ejection
            EIT Wave
            Energetic Solar Particle Event
            Forbush Decrease
            Geomagnetic Storm
            Interplanetary Shock
            Magnetic Cloud
            Magnetopause Crossing
            Radio Burst
            Solar Flare
            Solar Wind Extreme
            Substorm

Phi — Item
The angle between the meridian of a vector and the zero meridian of the coordinate system in which the vector is expressed. Equivalently, the angle between the projection of a position or measured vector into the X-Y plane and X-axis in the coordinate system in which the vector is expressed. Also referred to as the azimuthal angle or "longitude". Mathematically: Phi = arctan(y/x)

Phone Number — Text
The symbols and numerals required to contact an individual by telephone. The string may contain punctuation marks such as dash (-) or dot (.) to separate fields within the string.

Photometer — Item
An instrument which measures the strength of electromagnetic radiation in the range from

ultraviolet to infrared and including the visible spectrum.

Photon	Container

Photon (radio through gamma-rays): the fundamental particle or quantum of electromagnetic radiation (radiant energy)
    Sub-elements:
        Energy Range
        Frequency Range
        Photon Qualifier
        Photon Quantity
        Wavelength Range

Photon Qualifier	Enumeration

Characterizes the directional and statistical aspects of the photon observation.
    Allowed Values:
        Average
        Circular
        Line of Sight
        Linear
        Peak
        Scalar
        Standard Deviation
        Stoke's Parameters
        Uncertainty
        Variance

Photon Quantity	Enumeration

A characterization of the physical properties of the photon.
    Allowed Values:
        Emissivity
        Energy Flux
        Equivalent Width
        Gyrofrequency
        Line Depth
        Magnetic Field
        Mode Amplitude
        Plasma Frequency
        Polarization
        Stoke's Parameters
        Velocity

Photopolarimeter	Item

An instrument which measures the intensity and polarization or radiant energy. A photopolarimeter is a combination of a photometer and a polarimeter.

Photosphere	Item

The atmospheric layer of the Sun or a star from which continuum radiation, especially optical, is emitted to space. For the Sun, the photosphere is about 500 km thick.

Physical Parameter	Container

A container of information regarding a parameter whose values are part of the product. Every product contains or can be related to one or more parameters.
    Sub-elements:
        Cadence
        Caveats
        Coordinate System
        Description
        FillValue
        Measured
        Name
        Parameter Key
        Structure

> Support
> Units
> Units Conversion
> ValidMax
> ValidMin

Plasma Beta   Item

The ratio of the plasma pressure to the magnetic pressure.

Plasma Frequency   Item

The frequency with which a plasma oscillates.

Plasmasphere   Item

A region of the magnetosphere consisting of low energy (cool) plasma. It is located above the ionosphere. The outer boundary of the plasmasphere is known as the plasmapause, which is defined by an order of magnitude drop in plasma density.

Pluto   Item

The ninth (sub)planet from the sun in our solar system.

Polar   Item

The region near the pole of a body. For a magnetosphere the polar region is the area where magnetic field lines are open and includes the aural zone.

Polar Angle   Item

The angle between the Z axis and the given vector direction.

Polar Angle Range   Container

The range of possible polar angles for a group of energy observations. Defaults units are degrees.

> Sub-elements:
> > Bin
> > High
> > Low
> > Units

Polar Cap   Item

The areas of the globe surrounding the poles and consisting of the region north of 60 degrees north latitude an the region south of 60 degrees south latitude.

Polarization   Item

Direction of the electric vector of an electromagnetic wave. The wave can be linearly polarized in any direction perpendicular to the direction of travel, circularly polarized (clockwise or counterclockwise), unpolarized, or mixtures of the above.

Positional   Item

The specification of the location of an object or measurement within a reference coordinate system. The position is usually expressed as a set of values corresponding to the location along a set of orthogonal axes together with the date/time of the observation.

Postscript   Item

A page description programming language created by Adobe Systems Inc. that is a device-independent industry standard for representing text and graphics.

Potential   Item

A field which obeys Laplace's Equation.

Poynting Flux   Item

The rate of energy transport per unit area per steradian.

Pressure	Item

The force per unit area exerted by a particle distribution or field.

Principal Investigator	Item

An individual who is the administrative and scientific lead for an investigation.

Prior ID	Text

The resource identifier for a resource that is superceeded or replaced by a resource.

Processing Level	Enumeration

The standard classification of the processing performed on the product.
Allowed Values:
Calibrated
Raw
Uncalibrated

Profile	Item

Measurements of a quantity as a function of height above an object such as the limb of a body.

Project Scientist	Item

An individual who is an expert in the phenomenon and related physics explored by the project. A project scientist may also have a manageral role within the project.

Proportional Counter	Item

An instrument which measures energy of ionization radiation based on interactions with a gas.

Proton	Item

An elementary particle that is a constituent of all atomic nuclei, that carries a positive charge numerically equal to the charge of an electron, and that has a mass of 1.673 x 10**(-24) gram.

Provider ID	Item

The identifier for a Contact resource for the person or organization who provided the resource.

Provider Processing Level	Text

The provider specific classification of the processing performed on the product.

Provider Resource Name	Text

A short textual description of a resource used by the provider which may be used to identify a resource.

Provider Version	Text

Describes the release or edition of the product used by the provider. The formation rule may vary between providers. It is intended to aid in queries to the provider regarding the product.

Publisher	Item

An individual, organization, institution or government department responsible for the production and dissemination of a document.

Quadrispherical Analyser	Item

An instrument used for the 3-D detection of plasma, energetic electrons and ions, and for positive-ion composition measurements.

Quantity	Numeric

A value that describes a characteristic of a system.

QuickTime	Item

A format for digital movies, as defined by Apple Computer. See
<http://developer.apple.com/quicktime/>

R	Item

The component of a vector in the radial direction from the center of the coordinate system.

RTF	Item

Rich Text Format (RTF). Structured information as defined by Microsoft.

RTN	Item

Radial Tangential Normal. Typically centered at a spacecraft. Used for IMF and plasma V vectors. R (radial) axis is radially away from the Sun, T (tangential) axis is normal to the plane formed by R and the Sun's spin vector, positive in the direction of planetary motion. N (normal) is R x T.

Radar	Item

An instrument that uses directional properties of returned power to infer spatial and/or other characteristics of a remote object.

Radiance	Item

A radiometric measurement that describe the amount of electromagnetic radiation that passes through or is emitted from a particular area, and falls within a given solid angle in a specified direction. They are used to characterize both emission from diffuse sources and reflection from diffuse surfaces. The SI unit of radiance is watts per steradian per square meter (W·sr-1·m-2).

Radiation Belt	Item

The region within a magnetosphere where high-energy particles could potentially be trapped in a magnetic field.

Radio Burst	Item

Emissions of the sun in radio wavelengths from centimeters to dekameters, under both quiet and disturbed conditions. Radio Bursts can be "Type I" consisting of many short, narrow-band bursts in the metric range (300 - 50 MHz).; "Type II" consiting of narrow-band emission that begins in the meter range (300 MHz) and sweeps slowly (tens of minutes) toward dekameter wavelengths (10 MHz).; "Type III" consiting of narrow-band bursts that sweep rapidly (seconds) from decimeter to dekameter wavelengths (500 - 0.5 MHz); and "Type IV" consiting of a smooth continuum of broad-band bursts primarily in the meter range (300 - 30 MHz).

Radio Frequency	Item

Photons with a wavelength range: 100,000 to 1.00x10^11 nm

Radio Soundings	Item

Measurements of plasma density, magnetic field and possibly other parameters of the space environment by active probing of the plasma by radio waves.

Radio and Plasma Waves	Item

Measurements of electric and/or magnetic fields using electric or magnetic antennas at frequencies anywhere between the spacecraft spin frequency and the characteristic frequencies of the ambient plasma. The output can be waveform, power spectral density, or other statistical parameters.

Radiometer	Item

An instrument for detecting or measuring radiant energy. Radiometers are commonly limited to infrared radiation.

Ratio	Item

The relative magnitudes of two quantities.

Registry	Container

A location or facility where resources are cataloged.
Sub-elements:
Extension
Resource Header
Resource ID

Relative Stop Date	Duration

An indication of the nominal end date relative to the present.

Release Date	DateTime

The date and time when a resource is made available. The availability of a resource coincides with the release of a resource description. If the Release Date is specified as a future date then it indicates that resource should not be made available until that time. However, this is only advisory and in practice the Release Date should be the actual date the resource description was published.

Remote 1AU	Item

The heliospheric region near the Earth's orbit, but exclusive of the region near the Earth.

Repository	Container

A location or facility where resources are stored.
  Sub-elements:
    Extension
    Resource Header
    Resource ID

Resonance Sounder	Item

A combination of a radio receiver and a pulsed transmitter used to study the plasma surrounding a spacecraft by identifying resonances or cut-offs (of the wave dispersion relation), whose frequencies are related to the ambient plasma density and magnetic field. When the transmitter is off it is essentially a high frequency-resolution spectral power receiver.

Resource Header	Container

Attributes of a resource which pertain to the provider of the resource and descriptive information about the resource.
  Sub-elements:
    Acknowledgement
    Alternate Name
    Association ID
    Contact
    Description
    Expiration Date
    Information URL
    Prior ID
    Release Date
    Resource Name

Resource ID	Text

A Resource ID is a URI that has the form "scheme://authority/path" where "scheme" is "spase" for those resources administered through the SPASE framework, "authority" is the unique identifier for the resource provider registered within the SPASE framework and "path" is the unique identifier of the resource within the context of the "authority". The resource ID must be unique within the SPASE framework.

Resource Name	Text

A short textual description of a resource which may be useful when read by a person.

Restricted	Item

Access to the product is regulated and requires some form of identification.

Retarding Potential Analyzer	Item

An instrument which measures ion temperatures and ion concentrations using aplanr ion trap.

Riometer	Item

An instrument which measure the signal strength in various directions of the galatic radio signals. Variations in these signals are influenced by solar flare activity and geomagnetic storm and substorm processes.

Role	Enumeration

The assigned or assumed function or position of an individual.

Allowed Values:

Archive Specialist
Co-Investigator
Contributor
Data Producer
Deputy-PI
General Contact
Metadata Contact
Principal Investigator
Project Scientist
Publisher
Scientist
Team Leader
Team Member
Technical Contact

SC	Item

Spacecraft - A coordinate system defined by the spacecraft geometry and/or spin. Often has Z axis parallel to spacecraft spin vector. X and Y axes may or may not corotate with the spacecraft. See SR and SR2 below.

SE	Item

Solar Ecliptic - A heliocentric coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis is positive towards the first point of Aries (from Earth to Sun at vernal equinox). Same as HAE above. See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>

SGI	Item

Binary data compatible with Silicon Graphic platforms.

SHA1	Item

Secure Hash Algorithm (SHA), a 160-bit message digest algorithm developed by the NSA and described in Federal Information Processing Standard (FIPS) publication 180-1.

SHA256	Item

Secure Hash Algorithm (SHA), a 256-bit message digest algorithm developed by the NSA and described in Federal Information Processing Standard (FIPS) publication 180-1.

SM	Item

Solar Magnetic - A geocentric coordinate system where the Z axis is northward along Earth's dipole axis, X axis is in plane of z axis and Earth-Sun line, positive sunward. See Russell, 1971.

SPASE	Container

Space Physics Archive Search and Extract (SPASE). The outermost container or envelope for SPASE metadata. This indicates the start of the SPASE metadata.

SR	Item

Spin Reference - A special case of a Spacecraft (SC) coordinate system for a spinning spacecraft. Z is parallel to the spacecraft spin vector. X and Y rotate with the spacecraft. See <http://cdpp.cnes.fr/00428.pdf>

SR2	Item

Spin Reference 2 - A special case of a Spacecraft (SC) coordinate system for a spinning spacecraft. Z is parallel to the spacecraft spin vector. X is in the plane defined by Z and the spacecraft-Sun line, positive sunward. See <http://cdpp.cnes.fr/00428.pdf>

SSE	Item

Spacecraft Solar Ecliptic - A coordinate system used for deep space spacecraft, for example Helios. - X axis from spacecraft to Sun. Z axis normal to ecliptic plane, positive northward.

Note: Angle between normals to ecliptic and to Helios orbit plane ~ 0.25 deg.

Saturn	Item

The sixth planet from the sun in our solar system.

Scalar	Item

A quantity that is completely specified by its magnitude and has no direction.

Scientist	Item

An individual who is an expert in the phenomenon and related physics represented by the resource.

Scintillation Detector	Item

An instrument which detects flouresences of a material which is exceited by high energy (ionizing) electromagnetic or charged particle radiation.

Search Coil	Enumeration

An instrument which measures the time variation of the magnetic flux threading a loop by measurement of the electric potential difference induced between the ends of the wire.

Service	Container

A location or facility that can perform a well defined task.
>   Sub-elements:
>   Access URL
>   Extension
>   Resource Header
>   Resource ID

Size	Sequence

The number of elements in each dimension of a multi-dimensional array. =1 for a scalar; = n for a vector, the number of vector elements; = (m, n, p ...),   Note that the number of elements in the size of an N-dimensional array conveys the array's dimensionality while the product of those numbers conveys the total number of elements in the array. When size is used to describe a tensor it is the number of elements in the tensor. As such it has a limited set of values. A tensor of rank 1 has a size of 3, rank 2 a size of 9, rank 3 a size of 27 and rank n a size of 3^n.

Soft X-rays	Item

Range: 0.1 <= x < 10 nm; Conventional abbreviation: XUV; VSO nickname: Soft X-ray image

Solar Flare	Item

An explosive event in the Sun's atmosphere which produces electromagnetic radiation across the electromagnetic spectrum at multiple wavelengths from long-wave radio to the shortest wavelength gamma rays.

Solar Wind Extreme	Item

Intervals of unusually large or small values of solar wind attributes such as flow speed and ion density.

Sonic Mach Number	Item

The ratio of the bulk flow speed to the speed of sound in the medium.

Sounder	

An instrument which measures the radiances from an object. A sounder may measure radiances at multile spectral ranges.

South Atlantic Anomaly Region	Item

The region where Earth's inner van Allen radiation belt makes its closest approach to the planet's surface. The result is that, for a given altitude, the radiation intensity is higher over this region than elsewhere.

Spacecraft Orbit Plane   Item

A coordinate system where X lies in the orbit plane normal to and in the direction of motion of the spacecraft, Z in normal to the orbit plane and Y completes the triad in a right-handed coordinate system.

Spacecraft Potential Control   Item

An instrument to control the electric potential of a spacecraft with respect to the ambient plasma by emitting a variable current of positive ions.

Spatial Range   Item

A description, in an appropriate coordinate system, of the positions of the elements of an image; may be done using a reference and relative positions, or with bins giving the description of a 2-D grid.

Spectral Power Receiver   Item

A radio receiver which determines the power spectral density of the electric or magnetic field, or both, at one or more frequencies.

Spectral Range   Enumeration

The general term used to describe wavelengths or frequencies within a given span of values for those quantities.

Allowed Values:

- Ca-K
- Extreme Ultraviolet
- Gamma Rays
- H-alpha
- Hard X-rays
- He-10830
- Infrared
- K-7699
- Microwave
- Na-D
- Ni-6768
- Optical
- Radio Frequency
- Ultraviolet
- White-light
- X-Rays

Spectrometer   Item

An instrument that measures the component wavelengths of light or other electromagnetic radiation into its component wavelengths.

Spectrum   Item

A three-dimensional representation of successive spectra which allows time evolution to be clearly seen. Time is plotted along the abscissa, frequency (or particle energy) along the ordinate, and the spectral power density (or differential particle flux) is represented by different shades of grey, or color. This representation is also known as a spectrogram.

Spherical   Item

A system of curvilinear coordinates characterized by an azimuthal angle (longitude), a polar angle (latitude), and a distance (radius) from a point to the origin.

Standard Deviation   Item

The square root of the average of the squares of deviations about the mean of a set of data. Standard deviation is a statistical measure of spread or variability.

Start Date   DateTime

The specification of a starting point in time.

Stoke's Parameters   Item

The four coordinates (usually called I, Q, U, and V) relative to a particular basis for the representation of the polarization state of an electromagnetic wave propagating through space.

Stop Date	DateTime

The specification of a stopping point in time.

Stratosphere	Item

The layer of the atmosphere that extends from the troposphere to about 30 km, temperature increases with height. The stratosphere contains the ozone layer.

Structure	Container

The organization and relationship of individual values within a quantity.
 Sub-elements:
  Description
  Element
  Size

Substorm	Item

A process by which plasma in the magnetotail becomes energized at a fast rate.

Sun	Enumeration

The star upon which our solar system is centered.
 Allowed Values:
  Chromosphere
  Corona
  Interior
  Photosphere
  Transition Region

Support	Container

Information useful in understanding the context of an observation, typically observed or measured coincidentally with a physical observation.
 Sub-elements:
  Support Quantity

Support Quantity	Enumeration

A characterization of the support information.
 Allowed Values:
  Other
  Positional
  Temporal

Surface	Item

The outermost area of a solid object.

TAR	Item

A file format used to collate collections of files into one larger file, for distribution or archiving, while preserving file system information such as user and group permissions, dates, and directory structures. The format was standardized by POSIX.1-1988 and later POSIX.1-2001.

TIFF	Item

A binary format for still pictures. Tagged Image Format File (TIFF). Originally developed by Aldus and now controlled by Adobe.

TeX	Item

A document expressed in the typesetting language TeX originally defined by Donald Knuth.

Team Member	Item

An individual who is a major participant in an investigation.

Technical Contact	Item

An individual who can provide specific information with regard to the resource or supporting software

Temperature	Item

A measure of the kinetic energy of random motion with respect to the average. Temperature is properly defined only for an equilibrium particle distribution (Maxwellian distribution).

Temporal	Item

Pertaining to time.

Temporal Description	Container

A characterization of the time over which the measurement was taken.
> Sub-elements:
>> Cadence
>> Exposure
>> Time Span

Tensor	Item

A generalized linear "quantity" or "geometrical entity" that can be expressed as a multi-dimensional array relative to a choice of basis of the particular space on which it is defined.

Text	Item

ASCII text

Thermal Plasma	Item

Measurements of the plasma in the energy regime where the most of the plasma occurs. May be the basic fluxes in the form of distribution functions or the derived bulk parameters (density, flow velocity, etc.).

Thermal Speed	Item

For a Maxwellian distribution, the difference between the mean speed and the speed within which ~69% (one sigma) of all the members of the speed distribution occur.

Thermosphere	Item

The layer of the atmosphere that extends from the Mesosphere to 640+ km, temperature increasing with height.

Theta	Item

For spatial points, the angular distance from a meridian normal to the equator. Also referred to as the zenith angle or "latitude". As a "latitude" angles range from +90 to -90 with zero at the equator and positive angles are in the direction designated as "North." An alternate range of values is often called "co-latitude" where values range from 0 to +180 as measured from the "north" pole. Mathematically: Theta = $\arctan(\mathrm{sqrt}(x^2 + y^2)/z)$

Time Of Flight	Item

An instrument which measures the time it takes for a particle to travel between two detectors.

Time Span	Container

The duration of an interval in time.
> Sub-elements:
>> Note
>> Relative Stop Date
>> Start Date
>> Stop Date

Topside	Item

The region at the upper most areas of the ionosphere.

Transition Region	Item

A very narrow (<100 km) layer between the chromosphere and the corona where the temperature rises abruptly from about 8000 to about 500,000 K.

Troposphere	Item

The lowest layer of the atmosphere which begins at the surface and extends to between 7 km (4.4 mi) at the poles and 17 km (10.6 mi) at the equator, with some variation due to weather factors.

UDF	Item

Universal Data Format (UDF). The Optical Technology Storage Association's Universal Disk Format, based on ISO 13346. See <http://www.osta.org/specs/index.htm>

URL	Text

Uniform Resource Locator (URL) is the global address of documents and other resources on the World Wide Web. The first part of the address indicates what protocol to use, and the second part specifies the IP address or the domain name where the resource is located followed by the pathname of the resource. A URL is specified in the form protocol://server.domain.name:port/pathname. Example protocols are HTTP or FTP, server domain name is the Internet name.

Ultraviolet	Item

Photons with a wavelength range: 10 to 400 nm.

Uncalibrated	Item

Duplicate data are removed from the data stream and data are time ordered. Values are not adjusted for any potential biases or external factors.

Uncertainty	Item

A statistically defined discrepancy between a measured quantity and the true value of that quantity that cannot be corrected by calculation or calibration.

Unicode	Item

Text in multi-byte Unicode format.

Units	Text

A description of the standardized measurement increments in which a value is specified. The description is represented as a mathematical phrase. Units should be represented by widely accepted representation. For example, units should conform to the International System of Units (SI) which is maintained by BIPM (Bureau International des Poids et Mesures (see <http://www.bipm.fr/>) when appropriate or use tokens like "Re" to represent units of the Radius of the Earth. Within a phrase the circumflex (^) is used to indicate a power, a star (*) is used to indicate multiplication and a slash (/) division. When symbols are not separated by a mathematical operator, multiplication is assumed. Symbols for base units can be found at: <http://www.bipm.fr/en/si/si_brochure/chapter2/2-1/#symbols> and those for common derived units can be found at: <http://www.bipm.fr/en/si/derived_units/2-2-2.html>

Units Conversion	Text

The multiplicative factor for converting a unit into International System of Units (SI) units. The factor is expressed in the form "number > x", where "number" is a numerical value and "x" is the appropriate SI units. The basic SI units are Enumerated: m (meter), N (newton), kg (kilogram), Pa (pascal), s (second), Hz (hertz), A (ampere), V (volt), K (kelvin), W (watt), rad (radian), J (joule), sr (steradian), C (coulomb), T (tesla), ohm (ohm), mho (mho or seimens), H (henry), and F (farad). Two useful units which are not SI units are: degree (angle), and unitless (no units). An example is: "1.0E-5>T" which converts the units, presumable nT, to tesla. Another example is: "1.0e-1>km/s" which converts a velocity expressed in meters per second to kilometers per second.

Unspecified	Item

A value which is not provided.

Uranus	Item

The eigth planet from the sun in our solar system.

VOTable	Item

A proposed XML standard designed as a flexible storage and exchange format for tabular data.

ValidMax	Text

The largest legitmate value.

ValidMin	Text

The smallest legitmate value.

Variance	Item

A measure of dispersion of a set of data points around their mean value. The expectation value of the squared deviations from the mean.

Vector	Item

A set of parameter values each along some independent variable (e.g., components of a field in three orthogonal spatial directions; atmospheric temperature values at several altitudes, or at a given latitude and longitude;).

Velocity	Item

Rate of change of position. Also used for the average velocity of a collection of particles, also referred to as "bulk velocity".

Venus	Item

The second planet from the sun in our solar system.

Version	Text

Indicates the release identifier. When used to indicate the release of the SPASE data model, it is a in the form Major.Minor.Fix where Major: A significant change in the architecture of the model or rewrite of the implementation. This includes major changes in design or implementation language. This number starts at 0 (zero). Minor: An addition of terms or features that require changes in documentation/external API. This number starts at 0 (zero). Fix: Any change that doesn't require documentation/external API changes. This number starts at 0 (zero).

WGS84	Item

The World Geodetic System (WGS) defines a reference frame for the earth, for use in geodesy and navigation. The WGS84 uses the zero meridian as defined by the Bureau International de l'Heure.

Waveform Receiver	Item

A radio receiver which outputs the value of one or more components of the electric and/or magnetic field as a function of time.

Wavelength	Item

The distance between successive points of equal amplitude and phase on a wave (for example, crest to crest or trough to trough)

Wavelength Range	Container

The range of possible values for the observed wavelength.
      Sub-elements:
            Bin
            High
            Low
            Spectral Range
            Units

Wavenumber	Item

A quantity that is inversely proportional to the wavelength of a wave.

X	Item

The component of a vector along the X-axis in a cartessian coordinate system.

X-Rays	Item

Photons with a wavelength range: 0.001 <= x < 10 nm

XDR	Item

Binary data in the eXternal Data Representation (XDR) format. See RFC 1014
<http://www.faqs.org/rfcs/rfc1014.html>

XML	Item

eXtensible Mark-up Language (XML). A structured format for representing information. See
<http://www.w3.org/XML/>

Y	Item

The component of a vector along the Y-axis in a cartessian coordinate system.

Z	Item

The component of a vector along the Z-axis in a cartessian coordinate system.

ZIP	Item

An open standard for compression which is a variation of the LZW method and was originally
used in the PKZIP utility.

8. Enumeration of Selected Quantities

Lists are either "open" or "closed". The items in a "closed" list are determined by the SPASE model and definitions of each item is in the SPASE data dictionary. The items in an "open" list are determined by an external control authority. The URL for the control authority is indicated in the definition of each "open" list.

Access Rights List — Identifier

Identifiers for permissions granted or denied by the host of a product to allow other users to access and use the resource.

Term	Definition
Open	Access is granted to everyone.
Restricted	Access to the product is regulated and requires some form of identification.

Availability List — Identifier

Identifiers for indicating the method or service which may be used to access the resource.

Term	Definition
Offline	Not directly accessible electronically. This includes resources which may to be moved to an online status in response to a given request.
Online	Directly accessible electronically.

Component List — Closed

Identifiers for the axis of coordinate systems.

Term	Definition
Phi	The angle between the meridian of a vector and the zero meridian of the coordinate system in which the vector is expressed. Equivalently, the angle between the projection of a position or measured vector into the X-Y plane and X-axis in the coordinate system in which the vector is expressed. Also referred to as the azimuthal angle or "longitude". Mathematically: Phi = arctan(y/x)
R	The component of a vector in the radial direction from the center of the coordinate system.
Theta	For spatial points, the angular distance from a meridian normal to the equator. Also referred to as the zenith angle or "latitude". As a "latitude" angles range from +90 to -90 with zero at the equator and positive angles are in the direction designated as "North." An alternate range of values is often called "co-latitude" where values range from 0 to +180 as measured from the "north" pole. Mathematically: Theta = arctan(sqrt(x^2 + y^2)/z)
X	The component of a vector along the X-axis in a cartessian coordinate system.
Y	The component of a vector along the Y-axis in a cartessian coordinate system.
Z	The component of a vector along the Z-axis in a

cartessian coordinate system.

Coordinate Representation List   Closed

Term	Definition
Cartesian	A coordinate system in which the position of a point is determined by its distance from two or three mutually perpendicular axes.
Cylindrical	A system of curvilinear coordinates in which the position of a point in space is determined by its perpendicular distance from a given line, its distance from a selected reference plane perpendicular to this line, and its angular distance from a selected reference line when projected onto this plane.
Spherical	A system of curvilinear coordinates characterized by an azimuthal angle (longitude), a polar angle (latitude), and a distance (radius) from a point to the origin.

Coordinate System Name List   Closed

Identifiers for coordinate systems in which the position, direction or observation has been expressed.

Term	Definition
CGM	Corrected Geomagnetic - A coordinate system from a spatial point with GEO radial distance and geomagnetic latitude and longitude, follow the epoch-appropriate IGRF/DGRF model field vector through to the point where the field line crosses the geomagnetic dipole equatorial plane. Then trace the dipole magnetic field vector Earthward from that point on the equatorial plane, in the same hemisphere as the original point, until the initial radial distance is reached. Designate the dipole latitude and longitude at that point as the CGM latitude and longitude of the original point. See <http://nssdc.gsfc.nasa.gov/space/cgm/cgmm_des.html>
Carrington	A coordinate system which is centered at the Sun and is "fixed" with repsect to the synodic rotation rate; the mean synodic value is about 27.2753 days. The Astronomical Almanac gives a value for Carrington longitude of 349.03 degrees at 0000 UT on 1 January 1995.
DM	Dipole Meridian - A coordinate system centered at the observation point. Z axis is parallel to the Earth's dipole axis, positive northward. X is in the plane defined by Z and the line linking the observation point with the Earth's center. Y is positive eastward. See <http://cdpp.cnes.fr/00428.pdf>
GEI	Geocentric Equatorial Inertial - A coordinate system where the Z axis is along Earth's spin vector, positive northward. X axis points towards the first point of Aries (from the Earth towards the Sun at the vernal equinox). See Russell, 1971

GEO	Geographic - geocentric corotating - A coordinate system where the Z axis is along Earth's spin vector, positive northward. X axis lies in Greenwich meridian, positive towards Greenwich. See Russell, 1971.
GSE	Geocentric Solar Ecliptic - A coordinate system where the X axis is from Earth to Sun. Z axis is normal to the ecliptic, positive northward. See Russell, 1971.
GSEQ	Geocentric Solar Equatorial - A coordinate system where the X axis is from Earth to Sun. Y axis is parallel to solar equatorial plane. Z axis is positive northward. See Russell, 1971
GSM	Geocentric Solar Magnetospheric - A coordinate system where the X axis is from Earth to Sun, Z axis is northward in a plane containing the X axis and the geomagnetic dipole axis. See Russell, 1971
HAE	Heliocentric Aries Ecliptic - A coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis is positive towards the first point of Aries (from Earth to Sun at vernal equinox). Same as SE below. See Hapgood, 1992.
HCI	Heliographic Carrington Inertial.
HEE	Heliocentric Earth Ecliptic - A coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis points from Sun to Earth. See Hapgood, 1992
HEEQ	Heliocentric Earth Equatorial - A coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X axis is generally Earthward in the plane defined by the Z axis and the Sun-Earth direction. See Hapgood, 1992.
HG	Heliographic - A heliocentric rotating coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X, Y axes rotate with a 25.38 day period. The zero longitude (X axis) is defined as the longitude that passed through the ascending node of the solar equator on the ecliptic plane on 1 January, 1854 at 12 UT. See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>
HGI	Heliographic Inertial - A heliocentric coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X axis is along the intersection line between solar equatorial and ecliptic planes. The X axis was positive at SE longitude of 74.367 deg on Jan 1, 1900. (See SE below.) See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>
J2000	An astronomical coordinate system which uses the mean equator and equinox of Julian date 2451545.0 TT (Terrestrial Time), or January 1, 2000, noon TT. (aka J2000) to define a celestial reference frame.
LGM	Local Geomagnetic - A coordinate system used mainly for Earth surface or near Earth surface magnetic field

	data. X axis northward from observation point in a geographic meridian. Z axis downward towards Earth's center. In this system, H (total horizontal component) = SQRT (Bx**2 + By**2) and D (declination angle) = arctan (By/Bx)
MAG	Geomagnetic - geocentric. Z axis is parallel to the geomagnetic dipole axis, positive north. X is in the plane defined by the Z axis and the Earth's rotation axis. If N is a unit vector from the Earth's center to the north geographic pole, the signs of the X and Y axes are given by Y = N x Z, X = Y x Z.. See Russell, 1971, and <http://cdpp.cnes.fr/00428.pdf>
MFA	Magnetic Field Aligned - A coordinate system spacecraft-centered system with Z in the direction of the ambient magnetic field vector. X is in the plane defined by Z and the spacecraft-Sun line, positive sunward. See <http://cdpp.cnes.fr/00428.pdf>
RTN	Radial Tangential Normal. Typically centered at a spacecraft. Used for IMF and plasma V vectors. R (radial) axis is radially away from the Sun, T (tangential) axis is normal to the plane formed by R and the Sun's spin vector, positive in the direction of planetary motion. N (normal) is R x T.
SC	Spacecraft - A coordinate system defined by the spacecraft geometry and/or spin. Often has Z axis parallel to spacecraft spin vector. X and Y axes may or may not corotate with the spacecraft. See SR and SR2 below.
SE	Solar Ecliptic - A heliocentric coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis is positive towards the first point of Aries (from Earth to Sun at vernal equinox). Same as HAE above. See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>
SM	Solar Magnetic - A geocentric coordinate system where the Z axis is northward along Earth's dipole axis, X axis is in plane of z axis and Earth-Sun line, positive sunward. See Russell, 1971.
SR	Spin Reference - A special case of a Spacecraft (SC) coordinate system for a spinning spacecraft. Z is parallel to the spacecraft spin vector. X and Y rotate with the spacecraft. See <http://cdpp.cnes.fr/00428.pdf>
SR2	Spin Reference 2 - A special case of a Spacecraft (SC) coordinate system for a spinning spacecraft. Z is parallel to the spacecraft spin vector. X is in the plane defined by Z and the spacecraft-Sun line, positive sunward. See <http://cdpp.cnes.fr/00428.pdf>
SSE	Spacecraft Solar Ecliptic - A coordinate system used for deep space spacecraft, for example Helios. - X axis from spacecraft to Sun. Z axis normal to ecliptic plane, positive northward. Note: Angle between normals to ecliptic and to Helios orbit plane ~ 0.25 deg.

Spacecraft Orbit Plane	A coordinate system where X lies in the orbit plane normal to and in the direction of motion of the spacecraft, Z in normal to the orbit plane and Y completes the triad in a right-handed coordinate system.
WGS84	The World Geodetic System (WGS) defines a reference frame for the earth, for use in geodesy and navigation. The WGS84 uses the zero meridian as defined by the Bureau International de l'Heure.

Document Type List   Closed

Identifiers for the characterization of the content or purpose of a document.

Term	Definition
Paper	A formal presentation of an idea or discovery typically more than a few pages in length.

Earth List   Closed

Identifiers for the regions surrounding the Earth.

Term	Definition
Magnetosheath	The region between the bow shock and the magnetopause, characterized by very turbulent plasma.
Magnetosphere	The region of space above the atmosphere or surface of the planet, and bounded by the magnetopause, that is under the direct influence of the planet's magnetic field.
Near Surface	The gaseous and possibly ionized environment of a body extending from the surface to some specified altitude. For the Earth, this altitude is 2000 km.
Surface	The outermost area of a solid object.

Encoding List   Closed

Identifier for unambiguous rules that establishes the representation of information within a file.

Term	Definition
ASCII	A sequence of characters that adheres to American Standard Code for Information Interchange (ASCII) which is an 7-bit character-coding scheme.
BZIP2	An open standard algorithm by Julian Seward using Burrows-Wheeler block sorting and Huffman coding. See <http://www.bzip.org/>
Base64	A data encoding scheme whereby binary-encoded data is converted to printable ASCII characters. It is defined as a MIME content transfer encoding for use in internet e-mail. The only characters used are the upper- and lower-case Roman alphabet characters (A–Z, a–z), the numerals (0–9), and the "+" and "/" symbols, with the "=" symbol as a special suffix (padding) code.
GZIP	An open standard algorithm distributed by GHU based on LZ77 and Huffman coding. See <http://www.gnu.org/software/gzip/gzip.html> or <http://www.gzip.org/>
None	A lack or absence of anything.

TAR	A file format used to collate collections of files into one larger file, for distribution or archiving, while preserving file system information such as user and group permissions, dates, and directory structures. The format was standardized by POSIX.1-1988 and later POSIX.1-2001.
Unicode	Text in multi-byte Unicode format.
ZIP	An open standard for compression which is a variation of the LZW method and was originally used in the PKZIP utility.

Field Component List	Closed

Identifiers for components of a coordinate system which can be associated with a Field Quantity.

Field Qualifier List	Closed

Identifiers for terms which can be associated with a Field Quantity.

Term	Definition
Average	The statistical mean; the sum of a set of values divided by the number of values in the set.
Component	A part of a multi-part entity, e.g., the components of a vector.
Cross Spectrum	The Fourier transform of the cross correlation of two physical or empirical observations.
Deviation	The difference between an observed value and the expected value of a quantity.
Magnitude	A measure of the strength or size of a vector quantity.
Parallel	Having the same direction as a given direction
Peak	The maximum value for the quantity in question, over a period of time which is usually equal to the cadence.
Perpendicular	At right angles to a given direction.
Phase Angle	Phase difference between two or more waves, normally expressed in degrees.
Scalar	A quantity that is completely specified by its magnitude and has no direction.
Standard Deviation	The square root of the average of the squares of deviations about the mean of a set of data. Standard deviation is a statistical measure of spread or variability.
Tensor	A generalized linear "quantity" or "geometrical entity" that can be expressed as a multi-dimensional array relative to a choice of basis of the particular space on which it is defined.
Uncertainty	A statistically defined discrepancy between a measured quantity and the true value of that quantity that cannot be corrected by calculation or calibration.
Variance	A measure of dispersion of a set of data points around their mean value. The expectation value of the squared deviations from the mean.
Vector	A set of parameter values each along some independent variable (e.g., components of a field in three orthogonal

spatial directions; atmospheric temperature values at several altitudes, or at a given latitude and longitude;).

Field Quantity List	Closed

Identifiers for the physical attribute of the field.

Term	Definition
Current	The flow of electrons through a conductor caused by a potential difference.
Electric	The physical attribute that exerts an electrical force.
Electromagnetic	The physical attribute that is or is caused by a mutual interaction of electric and magnetic fields.
Gyrofrequency	The frequency with which a charged particle (as an electron) executes spiral gyrations in moving obliquely across a magnetic field
Magnetic	The physical attribute attributed to a magnet or its equivalent.
Potential	A field which obeys Laplace's Equation.
Poynting Flux	The rate of energy transport per unit area per steradian.

Format List	Closed

Identifiers for data organized according to preset specifications.

Term	Definition
AVI	Audio Video Interleave (AVI) a digital format for movies that conforms to the Microsoft Windows Resource Interchange File Format (RIFF).
Binary	A direct representation of the bits which may be stored in memory on a computer.
CDF	Common Data Format (CDF). A binary storage format developed at Goddard Space Flight Center (GSFC).
CEF	Cluster Exchange Format (CEF) is a self-documenting ASCII format designed for the exchange of data. There are two versions of CEF which are not totally compatible.
CEF 1	Cluster Exchange Format (CEF), version 1, is a self-documenting ASCII format designed for the exchange of data. The metadata contains information compatible with the ISTP recommendations for CDF.
CEF 2	Cluster Exchange Format (CEF), version 2, is a self-documenting ASCII format designed for the exchange of data and introduced for Cluster Active Archive. Compared to version 1, the metadata description of vectors and tensors is different.
FITS	Flexible Image Transport System (FITS) is a digital format primarily designed to store scientific data sets consisting of multi-dimensional arrays (1-D spectra, 2-D images or 3-D data cubes) and 2-dimensional tables containing rows and columns of data.
GIF	Graphic Interchange Format (GIF) first introduced in 1987 by CompuServe. GIF uses LZW compression and images are limited to 256 colours.

HDF	Hierarchical Data Format
HDF 4	Hierarchical Data Format, Version 4
HDF 5	Hierarchical Data Format, Version 5
HTML	A text file containing structured information represented in the HyperText Mark-up Language (HTML). See <http://www.w3.org/MarkUp/>
IDFS	Instrument Data File Set (IDFS) is a set of files written in a prescribed format which contain data, timing data, and meta-data. IDFS was developed at Southwest Research Institute (SwRI).
JPEG	A binary format for still images defined by the Joint Photographic Experts Group
MATLAB_4	MATLAB Workspace save set, version 4. MAT-files are double-precision, binary, MATLAB format files. MATLAB is a proprietary product of The MathWorks.
MATLAB_6	MATLAB Workspace save set, version 6. MAT-files are double-precision, binary, MATLAB format files. MATLAB is a proprietary product of The MathWorks.
MATLAB_7	MATLAB Workspace save set, version 7. MAT-files are double-precision, binary, MATLAB format files. Version 7 includes data compression and Unicode encoding. MATLAB is a proprietary product of The MathWorks.
MPEG	A digital format for movies defined by the Motion Picture Experts Group
NCAR	The National Center for Atmospheric Research (NCAR) format. A complete description of that standard is given in appendix C of the "Report on Establishment & Operation of the Incoherent- Scatter Data Base", dated August 23, 1984, obtainable from NCAR, P.O. Box 3000 Boulder, Colorado 80307-3000.
NetCDF	Unidata Program Center's Network Common Data Form (NetCDF). A self-describing data portable data format for array-oriented data access. See <http://my.unidata.ucar.edu/content/software/netcdf>
PDF	A document expressed in the Portable Document Format (PDF) as defined by Adobe.
PNG	A digital format for still images. Portable Network Graphics (PNG)
Postscript	A page description programming language created by Adobe Systems Inc. that is a device-independent industry standard for representing text and graphics.
QuickTime	A format for digital movies, as defined by Apple Computer. See <http://developer.apple.com/quicktime/>
TIFF	A binary format for still pictures. Tagged Image Format File (TIFF). Originally developed by Aldus and now controlled by Adobe.
Text	ASCII text
UDF	Universal Data Format (UDF). The Optical Technology Storage Association's Universal Disk Format, based on ISO 13346. See <http://www.osta.org/specs/index.htm>
VOTable	A proposed XML standard designed as a flexible storage

	and exchange format for tabular data.
XML	eXtensible Mark-up Language (XML). A structured format for representing information. See <http://www.w3.org/XML/>

Hash Function List   Closed

Identifiers for functions or algorithms that convert a digital data object into a hash value.

Term	Definition
MD5	Message Digest 5 (MD5) is a 128-bit message digest algorithm created in 1991 by Professor Ronald Rivest.
SHA1	Secure Hash Algorithm (SHA), a 160-bit message digest algorithm developed by the NSA and described in Federal Information Processing Standard (FIPS) publication 180-1.
SHA256	Secure Hash Algorithm (SHA), a 256-bit message digest algorithm developed by the NSA and described in Federal Information Processing Standard (FIPS) publication 180-1.

Heliosphere List   Closed

Identifiers for regions of the solar atmosphere which extends roughly from the inner corona to the edge of the solar plasma at the heliopause separating primarily solar plasma from interstellar plasma.

Term	Definition
Inner	The region of the heliosphere extending radially out from the "surface" of the Sun to 1 AU.
Near Earth	The heliospheric region near the Earth which extends to and includes the area near the L1 and L2 Lagrange point.
Outer	The region of the heliosphere from, but not including, 1 AU to the farthest extent of the heliosphere (heliopause).
Remote 1AU	The heliospheric region near the Earth's orbit, but exclusive of the region near the Earth.

Instrument Type List   Closed

Identifiers for the type of experiment the instrument performs. This is the technique of observation.

Term	Definition
Antenna	A sensor used to measure electric potential.
Channeltron	An instrument that detects electrons, ions, and UV-radiation, according to the principle of a secondary emission multiplier. It is typically used in electron spectroscopy and mass spectrometry.
Coronograph	An instrument which can image things very close to the Sun by using a disk to block the Sun's bright surface which reveals the faint solar corona and other celetrial objects.
Double Sphere	A dipole antenna of which the active (sensor) elements are small spheres located at the ends of two wires deployed in the equatorial plane, on opposite sides of a spinning spacecraft.

Electron Drift Instrument	An active experiment to measure the electron drift velocity based on sensing the displacement of a weak beam of electrons after one gyration in the ambient magnetic field.
Electrostatic Analyser	An instrument which uses charged plates to analyze the mass, charge and kinetic energies of charged particles which enter the instrument.
Energetic Particle Instrument	An instrument that measures fluxes of charged particles as a function of time, direction of motion, mass, charge and/or species.
Ephemeris	The spatial coordinates of a body as a function of time. When used as an Instrument Type it represents the process or methods used to generate spatial coordinates.
Faraday Cup	An instrument consisting of an electrode from which electrical current is measured while a charged particle beam (electrons or ions) impinges on it. Used to determine energy spectrum and sometimes ion composition of the impinging particles.
Flux Feedback	A search coil whose bandwidth and signal/noise ratio are increased by the application of negative feedback at the sensor (flux) level by driving a collocated coil with a signal from the preamplifier.
Fourier Transform Spectrograph	An instrument that determines the spectra of a radiative source, using time-domain measurements and a Fourier transform.
Geiger-Mueller Tube	An instrument which measures density of ionizing radiation based on interactions with a gas.
Imager	An instrument which samples the radiation from an area at one or more spectral ranges emitted or reflected by an object.
Imaging Spectrometer	An instrument which is a multispectral scanner with a very large number of channels (64-256 channels) with very narrow band widths.
Interferometer	An instrument which measures the difference between two or more waves.
Langmuir Probe	A monopole antenna associated with an instrument. The instrument applies a potential to the antenna which is swept to determine the voltage/current characteristic. This provides information about the plasma surrounding the probe and spacecraft.
Long Wire	A dipole antenna whose active (sensor) elements are two wires deployed in the equatorial plane on opposite sides of a spinning spacecraft, and whose length is several times greater than the spacecraft diameter.
Magnetometer	An instrument which measures the ambient magnetic field.
Microchannel Plate	An instrument used for the detection of elementary particles, ions, ultraviolet rays and soft X-rays constructed from very thin conductive glass capillaries.
Multispectral Imager	An instrument which captures images at multiple spectral ranges.

Neutral Atom Imager	An instrument which measures the quantity and properties of neutral particles over a range of angles. Measured properties can include mass and energy.
Particle Correlator	An instrument which correlates particle flux to help identify wave/particle interactions.
Photometer	An instrument which measures the strength of electromagnetic radiation in the range from ultraviolet to infrared and including the visible spectrum.
Photopolarimeter	An instrument which measures the intensity and polarization or radiant energy. A photopolarimeter is a combination of a photometer and a polarimeter.
Proportional Counter	An instrument which measures energy of ionization radiation based on interactions with a gas.
Quadrispherical Analyser	An instrument used for the 3-D detection of plasma, energetic electrons and ions, and for positive-ion composition measurements.
Radar	An instrument that uses directional properties of returned power to infer spatial and/or other characteristics of a remote object.
Radiometer	An instrument for detecting or measuring radiant energy. Radiometers are commonly limited to infrared radiation.
Resonance Sounder	A combination of a radio receiver and a pulsed transmitter used to study the plasma surrounding a spacecraft by identifying resonances or cut-offs (of the wave dispersion relation), whose frequencies are related to the ambient plasma density and magnetic field. When the transmitter is off it is essentially a high frequency-resolution spectral power receiver.
Riometer	An instrument which measure the signal strength in various directions of the galatic radio signals. Variations in these signals are influenced by solar flare activity and geomagnetic storm and substorm processes.
Scintillation Detector	An instrument which detects flouresences of a material which is exceited by high energy (ionizing) electromagnetic or charged particle radiation.
Search Coil	An instrument which measures the time variation of the magnetic flux threading a loop by measurement of the electric potential difference induced between the ends of the wire.
Sounder	An instrument which measures the radiances from an object. A sounder may measure radiances at multile spectral ranges.
Spacecraft Potential Control	An instrument to control the electric potential of a spacecraft with respect to the ambient plasma by emitting a variable current of positive ions.
Spectral Power Receiver	A radio receiver which determines the power spectral density of the electric or magnetic field, or both, at one or more frequencies.
Spectrometer	An instrument that measures the component wavelengths of light or other electromagnetic radiation into its component wavelengths.

Unspecified	A value which is not provided.
Waveform Receiver	A radio receiver which outputs the value of one or more components of the electric and/or magnetic field as a function of time.

Magnetosphere List   Closed

Identifiers for the region of space above the atmosphere or surface of the planet, and bounded by the magnetopause, that is under the direct influence of planet's magnetic field.

Term	Definition
Magnetotail	The region on the night side of the body where the magnetic filed is stretched backwards by the force of the solar wind. For Earth, the magnetotail begins at a night-side radial distance of 10 Re (X > -10Re).
Main	The region of the magnetosphere where the magnetic field lines are closed, but does not include the gaseous region gravitationally bound to the body.
Polar	The region near the pole of a body. For a magnetosphere the polar region is the area where magnetic field lines are open and includes the aural zone.
Radiation Belt	The region within a magnetosphere where high-energy particles could potentially be trapped in a magnetic field.

Measurement Type List   Closed

Identifiers for the method of making an estimated value of a quantity that forms the basis of an observaton.

Term	Definition
Activity Index	An indication, derived from one or more measurements, of the level of activity of an object or region, such as sunspot number, F10.7 flux, Dst, or the Polar Cap Indices.
Charged Particle Flux	Measurements of fluxes of charged or ionized particles at above thermal energies, including relativistic particles of solar and galactic origin. May give simple fluxes, but more complete distributions are sometimes possible. Composition measurements may also be made.
Dopplergram	A map or image depicting the spatial distribution of line-of-sight velocities of the observed object.
Electric Field	Measurements of electric field vectors (sometimes not all components) as a time series.
Energetic Particles	Pieces of matter that are moving very fast. Energetic particles include protons, electrons, neutrons, neutrinos, the nuclei of atoms, and other sub-atomic particles.
Ephemeris	The spatial coordinates of a body as a function of time. When used as an Instrument Type it represents the process or methods used to generate spatial coordinates.
Image Intensity	Measurements of the two-dimensional distribution of the intensity of photons from some region or object such as the Sun or the polar auroral regions; can be in any wavelength band, and polarized, etc.
Instrument Status	A quantity directly related to the operation or function of

	an instrument.
Ion Composition	In situ measurements of the relative flux or density of electrically charged particles in the space environment. May give simple fluxes, but full distribution functions are sometimes measured.
Irradiance	A radiometric term for the power of electromagnetic radiation at a surface, per unit area. "Irradiance" is used when the electromagnetic radiation is incident on the surface. The SI unit of irradiance is watts per square meter (W·m-2).
Magnetic Field	Measurements of magnetic field vectors (sometimes not all components) as time series; can be space- or ground-based. Also, [Zeeman splitting, etc. based]: A region of space near a magnetized body where magnetic forces can be detected [as measured by methods such as Zeeman splitting, etc.]
Magnetogram	Measurements of the vector or line-of-sight magnetic field determined from remote sensing measurements of the detailed structure of spectral lines, including their splitting and polarization. ("Magnetogram.")
Neutral Atom Images	Measurements of neutral atom fluxes as a function of look direction; often related to remote energetic charged particles that lose their charge through charge-exchange and then reach the detector on a line.
Neutral Gas	Measurements of neutral atomic and molecular components of a gas.
Profile	Measurements of a quantity as a function of height above an object such as the limb of a body.
Radiance	A radiometric measurement that describe the amount of electromagnetic radiation that passes through or is emitted from a particular area, and falls within a given solid angle in a specified direction. They are used to characterize both emission from diffuse sources and reflection from diffuse surfaces. The SI unit of radiance is watts per steradian per square meter (W·sr-1·m-2).
Radio Soundings	Measurements of plasma density, magnetic field and possibly other parameters of the space environment by active probing of the plasma by radio waves.
Radio and Plasma Waves	Measurements of electric and/or magnetic fields using electric or magnetic antennas at frequencies anywhere between the spacecraft spin frequency and the characteristic frequencies of the ambient plasma. The output can be waveform, power spectral density, or other statistical parameters.
Spectrum	A three-dimensional representation of successive spectra which allows time evolution to be clearly seen. Time is plotted along the abscissa, frequency (or particle energy) along the ordinate, and the spectral power density (or differential particle flux) is represented by different shades of grey, or color. This representation is also known as a spectrogram.

| Thermal Plasma | Measurements of the plasma in the energy regime where the most of the plasma occurs. May be the basic fluxes in the form of distribution functions or the derived bulk parameters (density, flow velocity, etc.). |

| Near Earth List | Closed |

Identifiers for heliospheric regions near the earth or within the earth's orbit

| Near Surface List | Closed |

Identifiers for regions of the gaseous and possibly ionized environment of a body extending from the surface to some specified altitude.

Term	Definition
Atmosphere	The neutral gases surrounding a body that extends from the surface and is bound to the body by virtue of the gravitational attraction.
Auroral Region	The region in the atmospheric where electrically-charged particles bombarding the upper atmosphere of a planet in the presence of a magnetic field produce an opitcal phenomenum.
Equatorial Region	A region centered on the equator and limited in latitude by approximately 23 degrees north and south of the equator.
Ionosphere	The charged or ionized gases surrounding a body that are nominally bound to the body by virtue of the gravitational attraction..
Mesosphere	The layer of the atmosphere that extends from the Stratosphere to a range of 80 km to 85 km, temperature decreasing with height.
Plasmasphere	A region of the magnetosphere consisting of low energy (cool) plasma. It is located above the ionosphere. The outer boundary of the plasmasphere is known as the plasmapause, which is defined by an order of magnitude drop in plasma density.
Polar Cap	The areas of the globe surrounding the poles and consisting of the region north of 60 degrees north latitude an the region south of 60 degrees south latitude.
South Atlantic Anomaly Region	The region where Earth's inner van Allen radiation belt makes its closest approach to the planet's surface. The result is that, for a given altitude, the radiation intensity is higher over this region than elsewhere.
Stratosphere	The layer of the atmosphere that extends from the troposphere to about 30 km, temperature increases with height. The stratosphere contains the ozone layer.
Thermosphere	The layer of the atmosphere that extends from the Mesosphere to 640+ km, temperature increasing with height.
Troposphere	The lowest layer of the atmosphere which begins at the surface and extends to between 7 km (4.4 mi) at the poles and 17 km (10.6 mi) at the equator, with some variation due to weather factors.

Observatory Group List   Open

For a current list see Identifiers for programmatically related observatories. The value is taken from an approved list of observatory group names. See <http://www.igpp.ucla.edu/spase/> for the list.

Observatory Name List   Open

For a current list see Identifiers for a location or platform. An observatory may be part of an observatory group. The value is taken from an approved list of observatory names. See <http://www.igpp.ucla.edu/spase/> for the list.

Particle Qualifier List   Closed

Identifiers for terms which can be associated with a Particle Quantity.

Term	Definition
Anisotropy	Direction-dependent property.
Average	The statistical mean; the sum of a set of values divided by the number of values in the set.
Characteristic	A quanity which can be easily identified and measured in a given environment.
Component	A part of a multi-part entity, e.g., the components of a vector.
Deviation	The difference between an observed value and the expected value of a quantity.
Differential	A flux measurement within a given energy and solid-angle range.
Fit	Values that make an model agree with the data.
Integral	The summation of values above a given threshold and over area or solid-angle range.
Magnitude	A measure of the strength or size of a vector quantity.
Moment	Parameters determined by integration over a distribution function convolved with a power of velocity.
Parallel	Having the same direction as a given direction
Peak	The maximum value for the quantity in question, over a period of time which is usually equal to the cadence.
Perpendicular	At right angles to a given direction.
Ratio	The relative magnitudes of two quantities.
Scalar	A quantity that is completely specified by its magnitude and has no direction.
Standard Deviation	The square root of the average of the squares of deviations about the mean of a set of data. Standard deviation is a statistical measure of spread or variability.
Tensor	A generalized linear "quantity" or "geometrical entity" that can be expressed as a multi-dimensional array relative to a choice of basis of the particular space on which it is defined.
Uncertainty	A statistically defined discrepancy between a measured quantity and the true value of that quantity that cannot be corrected by calculation or calibration.
Variance	A measure of dispersion of a set of data points around their mean value. The expectation value of the squared

	deviations from the mean.
Vector	A set of parameter values each along some independent variable (e.g., components of a field in three orthogonal spatial directions; atmospheric temperature values at several altitudes, or at a given latitude and longitude;).

Particle Quantity List   Closed

Identifiers for the characterization of the physical properties of the particle.

Term	Definition
Alfven Mach Number	The ratio of the bulk flow speed to the Alfven speed.
Average Charge State	A measure of the composite deficit (positive) or excess (negative) of electrons with respect to protons.
Counts	An enumeration of the number of detection events occurring in a particle detector per unit time or over detector accumulation times.
Energy	The capacity for doing work as measured by the capability of doing work (potential energy) or the conversion of this capability to motion (kinetic energy)
Energy Density	The amount of energy per unit volume.
Energy Flux	The amount of energy passing through a unit area in a unit time.
Flow Speed	The rate at which particles or energy is passing through a unit area in a unit time.
Gyrofrequency	The frequency with which a charged particle (as an electron) executes spiral gyrations in moving obliquely across a magnetic field
Heat Flux	Flow of thermal energy through a gas or plasma; typically computed as third moment of a distribution function.
Mass	The measure of inertia (mass) of individual objects (e.g., aerosols).
Mass Density	The mass of particles per unit volume.
Number Density	The number of particles per unit volume.
Number Flux	The number of particles passing through a unit area in a unit time.
Phase-Space Density	The number of particles per unit volume in the six-dimensional space of position and velocity.
Plasma Beta	The ratio of the plasma pressure to the magnetic pressure.
Pressure	The force per unit area exerted by a particle distribution or field.
Sonic Mach Number	The ratio of the bulk flow speed to the speed of sound in the medium.
Temperature	A measure of the kinetic energy of random motion with respect to the average. Temperature is properly defined only for an equilibrium particle distribution (Maxwellian distribution).
Thermal Speed	For a Maxwellian distribution, the difference between the mean speed and the speed within which ~69% (one sigma) of all the members of the speed distribution occur.
Velocity	Rate of change of position. Also used for the average

velocity of a collection of particles, also referred to as "bulk velocity".

Particle Type List   Closed

Identifiers for the characterization of the kind of particle observed by the measurement.

Term	Definition
Aerosol	A suspension of fine solid or liquid particles in gas.
Alpha Particle	A positively charged nuclear particle that consists of two protons and two neutrons.
Dust	Free microscopic particles of solid material.
Electron	An elementary particle consisting of a charge of negative electricity equal to about 1.602 x 10**(-19) Coulomb and having a mass when at rest of about 9.109534 x 10**(-28) gram.
Ion	An atom that has acquired a net electric charge by gaining or losing one or more electrons.(Note: Z>2)
Molecule	A group of atoms so united and combined by chemical affinity that they form a complete, integrated whole, being the smallest portion of any particular compound that can exist in a free state
Neutral	Either a particle, an object, or a system that has a net electric charge of zero
Proton	An elementary particle that is a constituent of all atomic nuclei, that carries a positive charge numerically equal to the charge of an electron, and that has a mass of 1.673 x 10**(-24) gram.

Phenomenon Type List   Closed

Identifiers for the characteristics or categorization of an observation. Note: Joe King to provide.

Term	Definition
Active Region	A localized, transient volume of the solar atmosphere in which PLAGEs, SUNSPOTS, FACULAe, FLAREs, etc. may be observed.
Aurora	An atmospheric phenomenon consisting of bands of light caused by charged solar particles following the earth's magnetic lines of force.
Bow Shock Crossing	A crossing of the boundary between the undisturbed (except for foreshock effects) solar wind and the shocked, decelerated solar wind of the magnetosheath.
Coronal Hole	An extended region of the corona, exceptionally low in density and associated with unipolar photospheric regions. A coronal hole can be an "open" magnetic field in the corona and (perhaps) inner heliosphere which has a faster than average outflow (wind); A region of lower than "quiet" ion and electron density in the corona; or a region of lower peak electron temperature in the corona than in the "quiet" corona.
Coronal Mass Ejection	A solar event which involves a burst of plasma which is ejected from the Sun into the interplanetary medium.
EIT Wave	A wave in the corona of the Sun which produce shock

waves on the Sun's chromosphere (Moreton Waves). EIT Waves are produced by large solar flare and expand outward at about 1,000 km/s. It usually appears as a slowly moving diffuse arc of brightening in H-alpha, and may travel for several hundred thousand km.

Energetic Solar Particle Event
An enhancement of interplanetary fluxes of energetic ions accelerated by interplanetary shocks and/or solar flares.

Forbush Decrease
A rapid decrease in the observed galactic cosmic ray intensity following the passage of an outwardly convecting interplanetary magnetic field disturbance, such as those associated with large CME's, that sweep some galactic cosmic rays away from Earth.

Geomagnetic Storm
A magnetospheric disturbance typically defined by variations in the horizontal component of the Earth's surface magnetic field. The variation typically starts with a field enhancement associated with a solar wind pressure pulse and continues with a field depression associated with an enhancement of the diamagnetic magnetospheric ring current.

Interplanetary Shock
A shock propagating generally antisunward through the slower solar wind, often seen in front of CME-associated plasma clouds.

Magnetic Cloud
A transient event observed in the solar wind characterized as a region of enhanced magnetic field strength, smooth rotation of the magnetic field vector and low proton density and temperature.

Magnetopause Crossing
A crossing of the interface between the shocked solar wind in the magnetosheath and the magnetic field and plasma in the magnetosphere.

Radio Burst
Emissions of the sun in radio wavelengths from centimeters to dekameters, under both quiet and disturbed conditions. Radio Bursts can be "Type I" consisting of many short, narrow-band bursts in the metric range (300 - 50 MHz).; "Type II" consiting of narrow-band emission that begins in the meter range (300 MHz) and sweeps slowly (tens of minutes) toward dekameter wavelengths (10 MHz).; "Type III" consiting of narrow-band bursts that sweep rapidly (seconds) from decimeter to dekameter wavelengths (500 - 0.5 MHz); and "Type IV" consiting of a smooth continuum of broad-band bursts primarily in the meter range (300 - 30 MHz).

Solar Flare
An explosive event in the Sun's atmosphere which produces electromagnetic radiation across the electromagnetic spectrum at multiple wavelengths from long-wave radio to the shortest wavelength gamma rays.

Solar Wind Extreme
Intervals of unusually large or small values of solar wind attributes such as flow speed and ion density.

Substorm
A process by which plasma in the magnetotail becomes energized at a fast rate.

Photon Qualifier List   Closed

Identifiers for terms which can be associated with a Photon Quantity.

Term	Definition
Average	The statistical mean; the sum of a set of values divided by the number of values in the set.
Circular	Relative to polarization, right-hand circularly polarized light is defined such that the electric field is rotating clockwise as seen by an observer towards whom the wave is moving. Left-hand circularly polarized light is defined such that the electric field is rotating counterclockwise as seen by an observer towards whom the wave is moving. The polarization of magnetohydrodynamic waves is specified with respect to the ambient mean magnetic field : right-hand polarized waves have a transverse electric field component which turns in a right-handed sense (that of the gyrating electrons) around the magnetic field.
Line of Sight	The line of sight is the line that connects the observer with the observed object. This expression is often used with measurements of Doppler velocity and magnetic field in magnetograms, where only the component of the vector field directed along the line of sight is measured.
Linear	Relative to polarization, confinement of the E-field vector to a given plane
Peak	The maximum value for the quantity in question, over a period of time which is usually equal to the cadence.
Scalar	A quantity that is completely specified by its magnitude and has no direction.
Standard Deviation	The square root of the average of the squares of deviations about the mean of a set of data. Standard deviation is a statistical measure of spread or variability.
Stoke's Parameters	The four coordinates (usually called I, Q, U, and V) relative to a particular basis for the representation of the polarization state of an electromagnetic wave propagating through space.
Uncertainty	A statistically defined discrepancy between a measured quantity and the true value of that quantity that cannot be corrected by calculation or calibration.
Variance	A measure of dispersion of a set of data points around their mean value. The expectation value of the squared deviations from the mean.

Photon Quantity List   Closed

Identifiers for the characterization of the physical properties of the photon.

Term	Definition
Emissivity	The ratio of radiant energy from a material to that from a blackbody at the same kinetic temperature
Energy Flux	The amount of energy passing through a unit area in a unit time.
Equivalent Width	The area of the spectral line profile divided by the peak

	height or depth.
Gyrofrequency	The frequency with which a charged particle (as an electron) executes spiral gyrations in moving obliquely across a magnetic field
Line Depth	In spectra, a measure of the amount of absorption for a particular wavelength or frequency in the spectrum
Magnetic Field	Measurements of magnetic field vectors (sometimes not all components) as time series; can be space- or ground-based. Also, [Zeeman splitting, etc. based]: A region of space near a magnetized body where magnetic forces can be detected [as measured by methods such as Zeeman splitting, etc.]
Mode Amplitude	In helioseismology the magnitude of oscillation of waves of a particular geometry.
Plasma Frequency	The frequency with which a plasma oscillates.
Polarization	Direction of the electric vector of an electromagnetic wave. The wave can be linearly polarized in any direction perpendicular to the direction of travel, circularly polarized (clockwise or counterclockwise), unpolarized, or mixtures of the above.
Stoke's Parameters	The four coordinates (usually called I, Q, U, and V) relative to a particular basis for the representation of the polarization state of an electromagnetic wave propagating through space.
Velocity	Rate of change of position. Also used for the average velocity of a collection of particles, also referred to as "bulk velocity".

Processing Level List   Closed

Identifiers to characterize the amount and type of manipulation which has been applied to the sampled data.

Term	Definition
Calibrated	Data wherein sensor outputs have been convolved with instrument response function, often irreversibly, to yield physical parameter values.
Uncalibrated	Duplicate data are removed from the data stream and data are time ordered. Values are not adjusted for any potential biases or external factors.

Region List   Closed

Identifiers for areas of the physical world which may be occupied or observed.

Term	Definition
Asteroid	A small extraterrestrial body consisting mostly of rock and metal that is in orbit around the sun.
Comet	A relatively small extraterrestrial body consisting of a frozen mass that travels around the sun in a highly elliptical orbit.
Earth	The third planet from the sun in our solar system.
Heliosphere	The solar atmosphere extending roughly from the outer corona to the edge of the solar plasma at the heliopause

separating primarily solar plasma from interstellar plasma.

Jupiter	The fifth planet from the sun in our solar system.
Mars	The forth planet from the sun in our solar system.
Mercury	The first planet from the sun in our solar system.
Neptune	The seventh planet from the sun in our solar system.
Pluto	The ninth (sub)planet from the sun in our solar system.
Saturn	The sixth planet from the sun in our solar system.
Sun	The star upon which our solar system is centered.
Uranus	The eigth planet from the sun in our solar system.
Venus	The second planet from the sun in our solar system.

Repository Name List   Open

For a current list see Identifiers for the location or facility where the product is stored. The repository name is selected from a list of established repositories. See <http://www.igpp.ucla.edu/spase/> for the list.

Role List   Closed

Identifiers for the assigned or assumed function or position of an individual.

Term	Definition
Archive Specialist	An individual who is an expert on a collection of resources and may also be knowledgable of the phenomenon and related physics represented by the resources. This includes librarians, curators, archive scientists and other experts.
Co-Investigator	An individual who is a scientific peer and major participant for an investigation.
Contributor	An entity responsible for making contributions to the content of the resource.
Data Producer	An individual who generated the resource and is familiar with its provenance.
Deputy-PI	An individual who is an administrative or scientific leader for an investigation operting under the supervision of a Princial Investigator.
General Contact	An individual who can provide information on a range of subjects or who can direct you to a domain expert.
Metadata Contact	An individual who can affect a change in the metadata describing a resource.
Principal Investigator	An individual who is the administrative and scientific lead for an investigation.
Project Scientist	An individual who is an expert in the phenomenon and related physics explored by the project. A project scientist may also have a manageral role within the project.
Publisher	An individual, organization, institution or government department responsible for the production and dissemination of a document.
Scientist	An individual who is an expert in the phenomenon and related physics represented by the resource.

Team Member	An individual who is a major participant in an investigation.
Technical Contact	An individual who can provide specific information with regard to the resource or supporting software

Spectral Range List   Closed

Identifiers for names associated with wavelengths. Based on the ISO 21348 Solar Irradiance Standard. Additions have been made to extend the frequency ranges to include those used in space physics. Those additions are indicated in blue text. The "Total Solar Irradiance" category has not been included since it is a type of measurement and not a specific spectral range. See Appendix A - Comparison of Spectrum Domains for a comparison of the spectral ranges with other systems.

Term	Definition
Ca-K	A spectrum with a wavelength of range centered near 393.5 nm. VSO nickname: Ca-K image with range of 391.9 nm to 395.2 nm.
Extreme Ultraviolet	A spectrum with a wavelength range of 10.0 nm to 125.0nm. VSO nickname: EUV image with a range of of 10.0 nm to 125.0 nm
Gamma Rays	Photons with a wavelength range: 0.00001 to 0.001 nm
H-alpha	A spectrum with a wavelength range centered at 656.3 nm. VSO nickname: H-alpha image with a spectrum range of of 655.8 nm to 656.8 nm.
Hard X-rays	Photons with a wavelength range: 0.001 to 0.1 nm
He-10830	A spectrum with a wavelength range centered at 1082.9 nm. VSO nickname: He 10830 image with a range of 1082.5 nm to 1083.3 nm.
Infrared	Photons with a wavelength range: 760 to 1.00x10^6 nm
K-7699	A spectrum with a wavelength range centerd at 769.9 nm. VSO nickname: K-7699 dopplergram with a range of 769.8 nm to 770.0 nm.
Microwave	Photons with a wavelength range: 1.00x10^6 to 1.50x10^7 nm
Na-D	A spectrum with a wavelength range of centered at 589.3 nm. VSO nickname: Na-D image with a range of 588.8 nm to 589.8 nm.
Ni-6768	A spectrum with a wavelength range centered at 676.8 nm. VSO nickname: Ni-6768 dopplergram with a range of of 676.7 nm to 676.9 nm.
Optical	Photons with a wavelength range: 380 to 760 nm
Ultraviolet	Photons with a wavelength range: 10 to 400 nm.
X-Rays	Photons with a wavelength range: $0.001 <= x < 10$ nm

Structure Type List   Closed

Identifiers for the classification of the organization of a structure.

Sun List   Closed

Identifiers for regions of the star upon which our solar system is centered.

Term	Definition
Chromosphere	The region of the Sun's (or a star's) atmosphere above the

temperature minimum and below the Transition Region. The solar chromosphere is approximately 400 km to 2100 km above the photosphere, and characterized by temperatures from 4500 - 28000 K.

Corona	The outermost atmospheric region of the Sun or a star, characterized by ionization temperatures above 10^5 K. The solar corona starts at about 2100 km above the photosphere; there is no generally defined upper limit.
Interior	The region inside the body which is not visible from outside the body.
Photosphere	The atmospheric layer of the Sun or a star from which continuum radiation, especially optical, is emitted to space. For the Sun, the photosphere is about 500 km thick.
Transition Region	A very narrow (<100 km) layer between the chromosphere and the corona where the temperature rises abruptly from about 8000 to about 500,000 K.

Support Quantity List   Closed

Identifiers for the information useful in understanding the context of an observation, typically observed or measured coincedently with a physical observation.

Term	Definition
Other	Values, such as flags, that are not time tags, location data or measured or derived parameters.
Positional	The specification of the location of an object or measurement within a reference coordinate system. The position is usually expressed as a set of values corresponding to the location along a set of orthogonal axes together with the date/time of the observation.
Temporal	Pertaining to time.

9. Appendix A - Comparison of Spectrum Domains

Electromagnetic Spectrum Domains
(all wavelengths given in nanometers)

Band	Wavelength [ISO 21348]		Wavelength [EGSO]		Wavelength [VSO]	
	min	max	min	max	min	max
Gamma	0.00001	0.001	-	0.025		
X	0.001	10	0.025	10	0.02	15
HXR	0.001	0.1	0.025	0.25	0.02	1
SXR$_1$	0.1	10	0.25	10	1	10
EUV	10	121	10	90	10	100
UV	100	400	90	320	90	380
Visible	380	760	320	700	350	1000
IR	760	10^6	700	10^6	700	$3.5*10^5$
Near IR	760	1400	700	$25*10^2$	700	
Mid IR	1400	3000	$25 \cdot 10^2$	$5 \cdot 10^4$		
Far IR	3000	10^6	$5 \cdot 10^4$	10^6	$3.5*10^5$	
Microwaves	10^6	$1.5*10^7$	10^6	10^9		
Radio	10^5	10^{11}	10^9	-	10^7	10^9

1 Also called "XUV" in ISO 21348

10. Bibliography

National Solar Observatory Sacramento Peak
http://www.sunspot.noao.edu/sunspot/pr/glossary.html

Terms and Definitions
http://www.pgd.hawaii.edu/eschool/glossary.htm

International System of Units (SI)
http://www.bipm.fr/en/si
Base units: http://www.bipm.fr/en/si/si_brochure/chapter2/2-1/#symbols
and those for Common derived units: http://www.bipm.fr/en/si/derived_units/2-2-2.html

ISO 8601:2004 - Date Format
http://en.wikipedia.org/wiki/ISO_8601
- or -
http://www.iso.ch/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=40874
- or -
http://www.iso.org/iso/en/prods-services/popstds/datesandtime.html

RFC 3339 - Date and Time on the Internet
The basis for the ISO 8601 standard. http://www.ietf.org/rfc/rfc3339.txt

RFC 1014 - XDR: External Data Representation standard
http://www.faqs.org/rfcs/rfc1014.html

11. Index

12. Change History

0.99.1	
2005-06-23	Removed duplicate entries.
2005-06-23	Added Chris Harvey's definitions for Electron Drift.
2005-06-23	Particle Correlator and Spacecraft Potential Control.
2005-06-23	Released.

0.99.2	
2005-07-07	Corrected "Numerical Data" entry under Product
2005-07-07	Released.

0.99.3	
2005-08-03	Added definitions supplied by J. Thieman, C. Harvey and T.King; Significant revision of document as suggested by Joe Hourcle

0.99.4	
2005-08-08	Restructured the taxonomy of elements to match the one suggested by A. Roberts.
2005-08-08	Added definitions for new elements introduced in the new taxonomy.
2005-08-08	Released.

0.99.5	
2005-08-26	Clarified some definitions and corrected typographical errors based on comments from J. Thieman and J. Hourcle.
2005-08-26	Changed data types of "Integer" to "Count" and "Double" to "Numeric".
2005-08-26	Added document elements to product resources.
2005-08-26	Added catalog, display data to top list.
2005-08-26	Included region descriptions from J. King with additions suggested by K. Reardon.
2005-08-26	Add parameters loosely based on a model proposed by A.Roberts.
2005-08-26	Released.

0.99.6	
2005-09-07	Corrected the inclusion of Atmosphere-Ionosphere regions into the Magnetosphere.
2005-09-07	Changed Surface to Ground.
2005-09-07	Removed Body and references to it.
2005-09-07	Added Spherical and Cartesian under Position.
2005-09-07	Remove Ratio (Numerator and Denominator).
2005-09-07	Change Upper Latitude to High Latitude, Lower to Low.
2005-09-07	Introduced "Photon Context" and "Particle Context" as replacements for "Independent Variable".
2005-09-07	Removed "Provider" and "Manufacture" resources and replaced with ID pointers.

0.99.7	
2005-09-08	Under Parameter add Description, Tensor Order.
2005-09-08	Change Photon Context and Particle Context to Independent Variable.
2005-09-08	Move Wavelength and Wave Number under Photon Independent Variable.
2005-09-08	Drop Speed from Particle Independent Variable.
2005-09-08	Move Polar Angle under Particle Independent Variable.
2005-09-08	Add Analysis Method under Field/Electric and

Field/Magnetic.

2005-09-08	Add Wave Form, Spectra etc. under Analysis Method.
2005-09-08	Add Near 1AU under Heliosphere; Add Body under Atmosphere-Ionosphere, Magnetosphere and Ground.
2005-09-08	Add all planets + Moon under Body.
2005-09-08	Update definition of Magnetotail, etc. to be generic, add Earth examples.
2005-09-08	Change "Acceptable abbreviation" to "Conventional abbreviation" since abbreviations are not supported in the model.
2005-09-08	Released.

0.99.8

2005-11-03	General clean-up and alignment with the schema agreed upon at the APL meeting (Nov 2-4, 2005)
2005-11-03	Released.

0.99.9

2005-11-18	Incorporate comments from consortium members on the "final" draft before the release of version 1.0
2005-11-18	Released.

1.0.0

2005-11-22	Incorporate comments from consortium members on the "final" draft before the release of version 1.0.
2005-11-22	Added Phenomenon Type list and defined terms in the list.
2005-11-22	Released.

1.0.1

2006-01-03	Changes in value type for elements: Exposure, InputResourceID, RepositoryName, Size.
2006-01-03	Added elements: Pressure.
2006-01-03	Released.

1.0.2

2006-03-07	Added "Project Scientist" to dictionary and "Role".
2006-03-07	Added "Caveats" under "Instrument".
2006-03-07	Added "Repository" resource class.
2006-03-07	Added "Registry" resource class.
2006-03-07	Released.

1.0.3

2006-04-27	Added "Earth" as a enumeration with "Magnetosphere" as a member.
2006-04-27	Changed "Observed Region" and "Instrument Region" to enumerations.
2006-04-27	Changed definition of "Item" to indicate it is a value of an enumeration.
2006-04-27	Move "Access Rights" under "Access Information".
2006-04-27	Made "Acknowledgement optional.
2006-04-27	Change "HF Radar" to "Radar".
2006-04-27	Added "NCAR" as a "Format".
2006-04-27	Dropped N, Z, Q from dictionary.
2006-04-27	Moved Mass and Size under "Particle Physical Quantity" and changed to type item.
2006-04-27	Added "Near Earth" under "Heliosphere" and added "Outside Bowshock" and "Orbital" under "Near Earth".
2006-04-27	Changed "Spectral Range Name" to "Spectral Range" for consistency.
2006-04-27	Correct links to "Stoke's Parameters".
2006-04-27	Released.

1.1.0

2006-08-31	Removed "Orbital".
2006-08-31	Modified definition of "Near Earth".
2006-08-31	Changed "Instrument type" to allow multiple occurrences.
2006-08-31	Made data type of "Mixed" text.
2006-08-31	Added "Service" resource class.
2006-08-31	Updated description of "Resource ID".
2006-08-31	Added MAT_4, MAT_6, MAT_7 and VOTable as a Format.
2006-08-31	Added J2000 as a coordinate system.
2006-08-31	Added Base64 as an Encoding.
2006-08-31	Added Parent ID, Energy Range, Frequency Range, Azimuthal Angle Range, Polar Angle Range, Atomic Number Range, Integral, Differential, Low and High.
2006-08-31	Remove Coordinate System from Particle Physical Parameter.
2006-08-31	Updated Pressure definition.
2006-08-31	Add ObservatoryID under Instrument.
2006-08-31	Remove Observatory ID from Numerical Data and Display Data.
2006-08-31	Changed definition of Investigation Name.
2006-08-31	Remove Access Right from Display Data.
2006-08-31	Change Repository Name to Repository ID under Access Information.
2006-08-31	Added Granule.
2006-08-31	Added Parameter Key under Physical Parameter.
2006-08-31	Add Release Date to Resource Header, Person, and Granule.
2006-08-31	Changed "alias" to "alternate name".
2006-08-31	Removed "Instrument Name" and "Observatory Name".
2006-08-31	Added ChargeState to Particle Quantity.
2006-08-31	Add Field Component container.
2006-08-31	Add Statistics to Phenomenon Type.
2006-08-31	Released.

1.1.1

	Changed InstrumentID and Bin to multiple occurrence.
	Removed enumeration of Component.
	Modified definition of Units.
	Changed AccessURL to type container.

1.2.0

2007-05-22	Added Aurora and Substorm under Phenomenon Type.
2007-05-22	Added Checksum, Hash Value, Hash Function, MD5 and SHA1, SHA256.
2007-05-22	Added Note as a term and added Note under Timespan.
2007-05-22	Added all planets, Comet and Asteroid as regions.
2007-05-22	Added Data Extent, Bytes and Per to describe the size of a resource.
2007-05-22	Added Data Extent to Access URL and Granule.
2007-05-22	Added the ValidMin, ValidMax and FillValue to Physical Parameter.
2007-05-22	Added Uncertainty and Standard Deviation to qualifiers.
2007-05-22	Added Expiration Date to Resource Header and Granule.
2007-05-22	Added Longitude and Latitude to Orientation.
2007-05-22	Updated Phi and Theta definitions.
2007-05-22	Added Ephemeris as an Instrument Type.
2007-05-22	Added Sequence as a element type and changes Size to a Sequence.
2007-05-22	Defined PriorID and added PriorID to ResourceHeader and Granule.
2007-05-22	Changed InstrumentID in DisplayData and

NumericalData to one or more occurrences.

2007-05-22	Added Metadata Contact to Role.
2007-05-22	Modified definitions of H, Flux, Integral and Differential.
2007-05-22	Cardinality of Access Information changed from 1 to + (1 or more).
2007-05-22	Added Deputy-PI to Roles;Changed cardinality of Caveats under Instrument to optional.
2007-05-22	Added Element with members of Name, Index, ParameterKey and Component.
2007-05-22	Added Element under Dimension.
2007-05-22	Removed Orientation.
2007-05-22	Made Component and enumeration with the values from Orientation.
2007-05-22	Added InstrumentStatus to MeasurementType.
2007-05-22	Converted Support to an enumeration with Other, Positional and Temporal as members.
2007-05-22	Added ProcessingLevel, Removed Theta and Phi.
2007-05-22	Added Postscript as a Format.
2007-05-22	Added "Extension" as a container.
2007-05-22	Made "URL" in "Granule" multi-valued.
2007-05-22	Changed name of "Date" data type to "DateTime" and "Time" data type to "Duration" to be consistent with conventional terminology.
2007-05-22	Under "Physical Parameter" made "Parameter Key" optional and "Name" required.
2007-05-22	Removed "Dynamic Spectra" from "Measurement Type".
2007-05-22	Added "Spectrum" to "Measurement Type".
2007-05-22	Removed D, H, T, N, Latitude, Longitude from the dictionary.
2007-05-22	Added "Theta" and "Phi" to "Component".
2007-05-22	Added Location container under Observatory and added the elements Latitude, Longitude, Elevation, ObservatoryGroup.
2007-05-22	Added ITM regions under Near Surface.
2007-05-22	Remove Instrument Region from NumericalData.
2007-05-22	Added WGS84 as a Coordinate System Name.
2007-05-22	Released.

1.2.1

2008-03-20	Added SpacecraftOrbitPlane to CoordinateSystemName.
2008-03-20	Added Parallel and PhaseAngle to FieldQualifier.
2008-03-20	Added Current, GyroFrequency, Energy, PlasmaFrequency to the appropriate ParticleQuantity, FieldQuantity, or PhotonQuantity.
2008-03-20	Added Characteristic to ParticleQualifier.
2008-03-20	Add EnergyRange and WavelengthRange to PhotonQuantity.
2008-03-20	Added White-light, H-alpha, He-10830, Ca-K, Na-D, Extreme Ultraviolet, Ni-6768, K-7699 to dictionary and to SpectralRange.
2008-03-20	Added Time Of Flight Interferometer, Photometer, Radiometer, Coronograph, ProportionalCounter, ScintillationDetector, Photopolarimeter, Geiger-MuellerTube, NeutralParticleDetector, Sounder, NeutralAtomImager, RetardingPotentialAnalyser, MultispectralImager, ImagingSpectrometer, Riometer, Unspecified to Instrument Type.
2008-03-20	Added Archive Specialist to Role.
2008-03-20	Added Flow Speed, Number Flux to Particle Quantity.
2008-03-20	Added Energy Flux to Particle Quantity and Photon Quantity.
2008-03-20	Added Anisotropy to Particle Qualifier.
2008-03-20	Added Carrington and HCI to Coordinate System.

2008-03-20	Updated definitions of Vector and Size.
2008-03-20	Removed Flux and Intensity.
2008-03-20	Released.

1.2.2

2008-07-31	Change "Plasmafrequency" to "Plasma Frequency".
2008-07-31	Change "Plasmafrequency" to "Plasma Frequency".
2008-07-31	Change "Retarding Potential Analyser" to "Retarding Potential Analyzer"
2008-07-31	Change "Time-of-flight" to "Time of flight".
2008-07-31	Change "Observatory Group" to "Observatory Name".
2008-07-31	Removed "Offline" from "Medium".
2008-07-31	Remove "Field Component" from lists.
2008-07-31	Remove "Near Earth" as a list.
2008-07-31	Added "Ionosphere" as a list.
2008-07-31	Azimuthal Angle,Dayside,Electric Field Instrument,Frequency,High Latitude,Low Latitude,Nightside,Polar Angle,Provider ID,Provider Release Date,RTF,SGI,Soft X-rays,Spatial Range,TeX,Wavelength,Wavenumber,XDR
2008-07-31	Added Repository ID and Stop Date
2008-08-14	Released.

1.3.0

2007	Add WavelengthRange to dictionary; Add BandName to Bin.
2007	Added SupportQuantity to Support.
2007	Moved Extension into each resource class.
2007	Add SpectralRange to EnergyRange, FrequencyRange and WavelengthRange.
2007	Added Units, UnitsConversion, ValidMin, ValidMax, FillValue to Element
2007	Added Fax Number to Person.
2007	Added Contributor and Publisher to dictionary and Role.
2007	Added Language to dictionary.
2008	Introduced Document resource.
2008	Added Document Type enumeration and Paper as an item.
2008	Added Number Flux to Particle Quantity.
2008	Moved CrossSpectrum from FieldQuantity to FieldQualifier.
2008	Added Electromagnetic to FieldQuantity.
2008	Added PhysicalParameter to Catalog and DisplayData.
2008-04-24	Removed "Structure Type" from dictionary and Structure.
2008-04-24	Removed "Observatory Group" from dictionary and Observatory.
2008-04-25	Removed "Provider Release Date" from dictionary.
2008-05-20	Added "Magnetic Cloud" to dictionary and "Phenomenon Type"
2008-05-20	Changed cardinality of "Phenomenon Type" to + in Catalog.
2008-04-24	Restored "Observatory Group" and made it multiple occurrence.
2008-05-22	Added "TAR" to the dictionary and to "Encoding Type".
2008-05-22	Made "Encoding Type" multiple occurrence (*) in "Access Information".
2008-05-22	Changed "End Date" to "Stop Date" and "Relative End Date" to "Relative Stop Date".
2008-05-22	Added "Active Region" to dictionary and "Phenomenon Type".
2008-05-22	Added "Coronal Hole" to dictionary and "Phenomenon Type".

2008-05-22	Added "Radio Burst" to dictionary and "Phenomenon Type".
2008-05-22	Added "EIT Waves" to dictionary and "Phenomenon Type".
2008-05-22	Fixed spelling of "Plasma Frequency" in the "Photon Qualifier" list.
2008-05-22	Removed "Array" from the Field, Photon and Particle qualifier lists.

1.3.1

2008-07-21	Updated description of duration type.
2008-07-31	Added "Set" to "Physical Parameter"
2008-07-31	Added "Source" dictionary and to "Granule", Removed URL, Checksum and Data Extent from Granule (now in Source)
2008-07-31	Added "Source Type" as a list with possible values of Data, Layout, Ancillary, Browse and Thumbnail.
2008-07-31	Added "Qualifier" as a unified list of all qualifiers. Removed "Field Qualifier", "Photon Qualifier" and "Particle Qualifier" from the dictionary. Replaced each with "Qualifier" in the ontology. Added "Qualifier" to "Support"
2008-07-31	Added "Trace" to the dictionary and to the "Qualifier" list.
2008-07-31	Added "Ion Drift" and "Dust Detector" to the dictionary and to the "Instrument Type" list.
2008-07-31	Added "Platform" to the dictionary and to the "Instrument Type" list, remove "Ephemeris" from the "Instrument Type" list.
2008-09-04	Added "Rendering Hints" with elements Format, AxisLabel, DisplayType, ScaleMin, ScaleMax, ScaleType and related enumerated values.
2008-09-04	Added "Symmetric" to the dictionary and to Qualifier.
2008-09-04	Changed "Physical Parameter" to "Parameter".
2008-09-04	Removed "Measured" and shifted containers under "Measured" up one level.
2008-09-04	Added "Velocity" to "Support Quantity".
2008-09-04	Added "Count Rate" to the dictionary and to "Particle Quantity".

1.3.2

2008-10-07	Removed "Charged Particle Flux" from Measurement Type and the dictionary.
2008-10-07	Added "Interstellar" to dictionary and Region.
2008-10-15	Changed "Format" under "Rendering Hints" to "Value Format" to eliminate name conflict with "Format".

1.3.3

2008-10-16	Added the "Association" container and "Association Type" enumeration to the dictionary. Modified the ontology to replace "Association Type" with the new "Association" container.

1.3.4

2009-01-14	Added "Wave", "Passive" and "Active" to the dictionary. Added "Wave" as an enumeration. Remove "Radio and Plasma Waves" and "Radio Soundings" from the "Measurement Type" enumeration and added "Wave" to the enumeration.
2009-01-14	Added "Linear Scale" and "Log Scale" to the dictionary. Removed "Log" from the dictionary. Modified the definition of "Linear" to remove reference scaled related usage. Updated the "Scale" enumeration with the name

changes.

2009-01-14	Added "Language" under "Information URL".
2009-01-14	Changed the definition of "Text" and converted "Text" to an enumeration with possible encoding types.
2009-01-14	Modified "Component" to consist of "I", "J", "K". Added "Direction Angle", and "Projection" to "Qualifier". Removed "R", "Theta", "Phi", "X", "Y", and "Z". Added "Direction Angle" as an enumeration with values of "Azimuth Angle", "Polar Angle" and "Elevation Angle". Added "Projection" as an enumeration with value of "IJ", "IK", and "JK".
2009-01-22	Modified definition of "Mixed"
2009-01-22	Changed occurrence of "Particle" to one or more.
2009-01-23	Added "Ion Chamber" to dictionary and "Instrument Type" list.
2009-02-05	Added (restored) "Intensity" to dictionary and "Photon Quantity" list.
2009-02-05	Changed "Line-of-sight" to "Line Of Sight".
2009-02-05	Added "Psuedo" and "Column" to the dictionary and to "Qualifier" list.
2009-02-26	Added "Annotation" resource and "Annotation Type" and "Confidence Rating" enumerations. The terms "Anomaly", "Event", "Feature", "Probable", "Good", "High" were added to support the new enumerations.
2009-02-27	Change "Wave" to "Waves".

1.3.5

2009-03-25	Updated definitions for "Numeric" and "Text" data types.
2009-03-26	Changed "Mixed" to a container with "Qualifier" and "Mixed Quantity" as attributes. Added "Mixed Quantity" enumeration with allowed values of "Alfven Mach Number", "Other", "Plasma Beta", "Thermal Pressure", "Alfven Velocity", "Magnetosonic Mach Number", "Plasma Beta", and "Plasma Frequency-To-Gyrofrequency Ratio".
2009-03-26	Added "Access URL" to "Repository" and "Registry".
2009-03-26	Added "Image URL" to "Annotation" and dictionary
2009-03-26	Various editorial updates to definitions, spelling and typos
2009-03-26	Added "Plasmagram", "Spectrogram" and "Wave Form" to the dictionary and to the "Display Type" list.
2009-03-26	Changed the name of "Photon" to "Waves" and "PhotonQuantity" to "WaveQuantity". Added "Wave Type" with values of "Electromagnetic", "Electrostatic", "Photon", "Plasma Waves", "Hydrodynamic", and "MHD".
2009-03-26	Updated definitions of "Emissivity", "Equivalent Width", "Gyrofrequency", "Intensity", "Line Depth", "Plasma Frequency", "Poynting Flux". Added "Wave Type" with values of "Electromagnetic", "Electrostatic", "Photon", "Plasma Waves", "Hydrodynamic", and "MHD".
2009-03-26	Added "Absorption", "AC-Electric Field", "AC-Magnetic Field", "Doppler Frequency", "Frequency", "Propagation Time", and "Wavelength" to dictionary and "Wave Quantity". Added "Wave Type" with values of "Electromagnetic", "Electrostatic", "Photon", "Plasma Waves", "Hydrodynamic", and "MHD".
2009-03-26	Added "Far Ultraviolet", "HE-304", "LBH Band" and "Soft X-Rays" to dictionary and "Spectral Range".
2009-04-06	Removed "Spectral Range" from under "Energy Range".

1.3.6

2009-04-09	Added "Atom" and "Neutron" to "Particle Type".

2009-04-09	Added "Array" and "Total" to "Qualifier".
2009-04-09	Added "Particle Type" to "Mixed".
2009-04-09	Added "Unlikely" and "Weak" to the dictionary and modified "Confidence Rating" to have values "Unlikely", "Weak", "Probable", and "Strong".
2009-04-09	Added "Classification Method" as a enumeration with allowed values of "Automatic", "Inspection", and "Inferred". Added "Classification Method" to "Annotation".
2009-04-09	Added "Observation Extent" with attributes of "Observed Region", "Start Location", "Stop Location" and "Note". Added "Observation Extent" to "Annotation".
2009-04-09	Added "Child Event Of" and "Observed By" to "Association Type".
2009-04-09	Added "Area", "Bandwidth" and "Solid Angle" to "Integral", added "Field-Aligned", "Group", "Perturbation", "Phase" and "Spectral" to "Qualifier".

2.0.0

2009-04-15	Released.

2.0.1

2009-07-12	Changed "Rendering Hints" to 0-to-many occurrence.
2009-07-12	Under "Element" replaced "Component" with "Qualifier" and allow multiple occurrences.
2009-07-12	Update the description of "Index" data type to explain wild cards.
2009-07-12	Added "Sound Speed" to dictionary and to "Particle Quantity".
2009-07-12	Updates to the definition "Access URL", "Data Extent", "Polar" and "Sonic Mach Number".

2.0.2

2009-09-24	Added "Atomic Number Detected", "Mass Number" and "Charge State" to dictionary and to "Particle Quantity" enumeration. Also added "Direction Angle" to "Particle Quantity".
2009-10-08	Added "Arrival Direction" to dictionary and to "Particle Quantity" enumeration. Added "Instrument Mode" to dictionary and "Support Quantity". Updated definitions of "Charge State" and "Atomic Number Detected".
2009-11-05	Added "Stream Interaction Region" to dictionary and to "Phenomenon Type" enumeration. Updated definition of "Coronal Mass Ejection".
2009-11-18	Modified definitions for "Observatory" and "Instrument".

2.0.3

2010-02-04	Added "Former-PI" to dictionary and to "Role" enumeration; Added "Note" to "Person".
2010-03-19	Updated definitions for "Number Flux", "Energy Flux", "Differential", and "Integral"; Added "Dust" to "Measurement Type" enumeration;

2.1.0

2010-03-19	Released.

2.2.0

2010-04-15	Added "Hardcopy" as an enumeration to dictionary and to "Format"; Added "Film", "Photographic Plate", "Photograph", "Microfiche", "Microfilm", "Print" to dictionary and to "Hardcopy" enumeration; Changed "Observatory Group" to "Observatory Group ID";

	Updated definition of "Observatory" to make it more suitable for creation of conceptual Observatories.; Added "Operating Span" to dictionary with elements "Start Date", "Stop Date" and "Note"; Added "Operating Span" to "Instrument" and "Observatory".;
2010-05-21	Added "Heliosheath" to dictionary and to "Heliosphere" enumeration;
2010-06-25	Added "Fluence" to dictionary and "Particle Quantity"; Updated definitions for "Number Flux", "Coordinate System" and "Counts"; Added "HCC" (Heliocentric Cartesian), "HCR" (Heliocentric Radial), HPC (Helioprojective Cartesian) and "HPR" (Helioprojective Radial) to dictionary and "Coordinate System Name"
2010-08-17	Added "S3_BUCKET" to dictionary and "Encoding"; Add "Directional" to dictionary and to "Qualifier"; updated definition for "Energy Flux" and "Differential"
2010-08-20	Updated definitions of "Outer", "Inner", "Heliosheath" and "Remote 1AU"
2010-09-15	Added "Excel" to dictionary and to "Format" list; Added "Rendering Axis", and "Index" to dictionary and under "Rendering Hints"; Add "Vertical", "Horizontal", and "Color Bar" to dictionary and to the "Rendering Hints" enumeration; Changed cardinality of "Investigation Name" from 1 to +; Add "Median, " Maximum" and "Minimum" to dictionary and to "Qualifer" list.;
2010-09-17	Added "SSE_L" to dictionary and to "Coordinate System Name" list;
2011-01-06	Updated definition for "irradence".
2011-01-06	Released.

2.2.1

2011-05-12	Strike "product" from the definition of "Numerical Data".;
2011-06-16	Added "core", "halo", "strahl" and "superhalo" to the dictionary and to "Qualifier";
2011-08-18	Released.

2.2.2

2011-09-26	Add "Rendering Hints" under "Element"; Set occurrence for "Coordinate Representation" and "Coordinate System Name" under "Coordinate Sytem" to required (1); Set "Size" under "Structure" to required (1); Set "Association ID" and "Association Type" under "Association" to required (1).
2011-10-27	Update definition of "Document"; Add "MIME Type" to dictionary and "Document" structure; Add "Presentation", "Poster", "White Paper", "Technical Note", "Specification" and "Report" to dictionary and to "Document Type" enumeration; Remove "Paper" from dictionary.
2012-02-02	Add "Sector Boundary Crossing" to the dictionary and the "Phenomenon Type" list.; Add "Product Key" to the dictionary and under "Access Information";
2012-02-27	Add "Albedo" to the dictionary and to "Wave Quantity" list.; Add "Partical Radius" to the dictionary and to the "Particle Quantity" list;
2012-02-27	Released.

2.2.3

2012-03-15	Modified definition of "Numerical Data" as suggested by R. Weigel and D.A. Roberts; Modified definition of "Potential" as suggested by F. Mozer, D.A. Roberts and S. Fung; Add "Magnetograph" to dictionary and

	"Instrument Type" as suggested by J. King
2012-05-10	Modified definitions of "GEI", "Azimuth Angle", "Elevation Angle" and "Polar Angle" as suggested by J.Merka; Add definition for "ENP and add to "Coordinate System Name" enumeration as suggested by J. Merka; Add definitions of "Photomultiplier Tube" and "Solid State Detector" to dictionary and "Intrument Type" as suggested by B. Weigel.
2012-05-24	Add definition of "Moon" and add to "Earth" enumeration as suggested by T. Narock.
2014-05-22	Released.

2.2.4

2015-05-28	Add coordinate systems MSO, VSO, KSO, KSM, JSO, JSM to dictionary and CoordinateSystemName, Add SolarUVFlux and IMFClockAngle to dictionary and MixedQuantity.
2015-05-31	Released.

2.2.5

2015-06-12	Add moons and magnetosphere to planets. Only the larger moons which are typically encountered or simulated were added.
2015-06-12	Add coordinate systems to enumeration.

2.2.6

2015-09-09	Released.

2.2.7

2016-07-21	Change occurrence of Particle->ParticalType from + to * and Wave->WaveType from 1 to 0.
2016-07-21	Add JSON and CSV to the dictionary and to Format enumeration.

2.2.8

2016-07-21	Released.

2.2.9

2017-02-09	Add CadenceMin, CadenceMax, ExposureMin, ExposureMax, PartiallyRestricted, Confidence, ProviderName, MassRange, PitchAngleRange; Change occurrence of Observatory/OperatingSpan from 1 to +.
2017-09-07	Add HGRTN, HERTN to dictionary and to CoordinateSystemName. Add Entropy to dictionary and ParticleQuantity.
2017-11-14	Released.

2.2.10

2018-02-08	Add DOI to dictionary and to ResourceHeader.