

# **A Space and Solar Physics Data Model**

**from the SPASE Consortium**

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## 1. Executive Summary

Research in Heliophysics requires information from multiple sources which includes data from and about spacecrafts, groundbased observatories, models, simulations and more. The results from research are also invaluable in building up a body of knowledge and need to be available. All the different sources and types of information are considered a "Resource". The Resources exist, are shared, exchanged and used in a framework called the "data environment". The SPASE (Space Physics Archive Search and Extract) group has defined a Data Model which is a set of terms and values along with the relationships between them that allow describing all the resources in a heliophysics data environment. It is the result of many years of effort by an international collaboration of heliophysicists and information scientists to unify and improve on existing Space and Solar Physics data models. The intent of this Data Model is to provide the means to describe resources, most importantly scientifically useful data products, in a uniform way so they may be easily registered, found, accessed, and used.

The 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 for 1992 to 2005), together with essential retrieval and contact information. It also allows for the incremental annotation of resources with expert assessments and the free association of resources to create bundles or networks of resources. Resource descriptions can be stored with the data or at remote locations. Sites can harvest the resource descriptions to enable services like a search engine or portal (Virtual Observatory). A typical use would be to have a collection of descriptions stored in one or more related internet-based registries of products; that can be queried with specifically designed search engines and ultimately link users to the data they need. The Data Model also provides constructs for describing components of such a data delivery system. This includes repositories, registries and services.

This document provides a specification of the SPASE Data Model. 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 defined 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.

The SPASE group website is located at <http://www.spase-group.org/>

A PDF version of this document can be downloaded from the SPASE site.

## 2. Introduction

The SPASE (Space Physics Archive Search and Extract) Data Model is a set of terms and values along with the relationships between them that allow describing all the resources in a heliophysics data environment. It is the result of many years of effort by an international collaboration (see <http://spase-group.org>) to unify and improve on existing Space and Solar Physics data models. The intent of this Data Model is to provide the means to describe resources, most importantly scientifically useful data products, in a uniform way so they may be easily registered, found, accessed, and used.

The SPASE data model divides the heliophysics data environment into a limited set of resource types. A key resource type is Numerical Data. This type of resource typically consists of a set of files containing values of one or more physical variables and that differ from each other only by the time span. To fully describe a Numerical Data resource requires other types of Resources, namely Observatory, Instrument, Person, and Repository, whose names are self-explanatory, and each of which has its own set of attributes. Often, numerical data are presented in prepared images (gif or jpeg), and such presentations are referred to as Display Data resources. The other data related resource types are Catalog which are lists of events; Annotation which enable expert comments on data products; and Granule which describe individual files within another resource (i.e., Numerical Data, Display Data or Catalog). Other types of resources include Document which can contain narratives or supporting information; Service that provide software to use data resources; Repository for storage locations; and Registry for metadata collections. Resource descriptions and the links in them are intended to make the Resource useful to scientific users.

### 2.1. History of Development

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. The SPASE Data Model was developed with an iterative process where additions were made when unaddressed needs were discovered. The original impetus occurred at an ISTP meeting in 1998 where a resolution was passed calling to make data more accessible. Interoperability test beds were constructed in 2001 and in 2002 a grassroots effort was undertaken to define the needs of community. 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 model in November 2005. Following the release of version 1.0 many existing data products were described and led to further improvements of the data model. Version 1.1 was released in August 2006. At this time NASA established the Heliophysics VxOs and after an extended period of use and improvements version 1.2.2 was released in August of 2008. The version of the data model described in this document is an extension of this earlier release.

### 2.2. Intended Purpose

The design of the SPASE data model is based on a core set of principles related to the intended purpose of descriptive information (metadata), the data environment, and the operational environment. The overall goal of the Data Model is to be able to describe resources using a

taxonomy of terms familiar to the heliophysics domain. This taxonomy should provide sufficient scientific context and data content information for an individual to assess the applicability of the resource (data and metadata) to a research question. A data model is the cornerstone of an information system and one purpose for the SPASE Data Model to enable the creation of "Virtual Observatories" that will link the broad range of heliophysics resources which may be available in a loosely coupled distributed environment. Additional goals of the data model are to:

- (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) Facilitate 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 content of a resource description based on the data model should enable services (either at the provider or in a VxO) to discover and access individual resources. The service layer can contain services for a variety of purposes. The basic functionality of the service layer is to provide the links necessary to connect user applications and search- and-retrieval front ends to data repositories. Ultimately, the data environment based on the data model will involve a number of software tools and services linked together as an internet-based environment. The data along with software tools and documentation associated with products will be directly accessible using standard web protocols (http, ftp). 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 investigate emerging questions in heliophysics.

### 2.3. Design Principles

The design of the SPASE data model begins with a few basic principles. These principles are:

- 1. Data is self-documented.** Data resources have internal schema or structures for storing values. The physical structure is determined by the storage format. Each retrievable entity on the format is assigned a key or tag which can be used to retrieve the entity.

The SPASE Data Model does not attempt to describe the physical storage of the parameters, for example, the byte offsets, record format or data encoding in the data resource. Instead, the SPASE Data Model describes the scientific attributes of the parameter and links this to the parameter by a key or tag used by the storage format. Applications can use the SPASE descriptions to locate a parameter and the appropriate format-specific reader to extract parameters.

Not all data in the Heliophysics data environment is stored in self- documented formats. For example, data stored as ASCII tables. The method of assigning a key or tag name for each field in the ASCII table is external to the SPASE data model. This method must be part of an "format" specification which may be as simple as the first row of the table containing the tag



name of the field.

- 2. Resources are distributed.** There are many providers of resources and these providers can be located anywhere in the world.

Each provider operates independently and activities are not necessarily coordinated. The SPASE data model assumes that providers have local autonomy and may operate under local rules or jurisdictions.

- 3. Online Resources have Universal Resource Locators (URL)** If a resource is on-line it can be accessed and retrieved using Universal Resource Locators (URL).

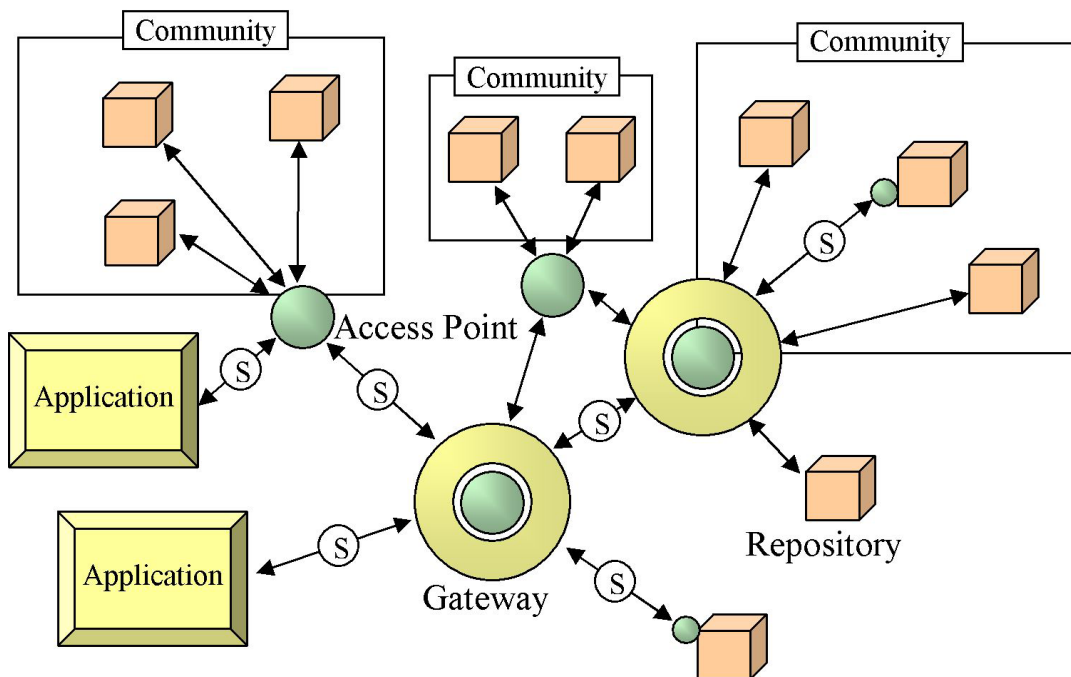
- 4. The data environment is continuously evolving.** New resources are actively generated either as part of an on-going experiment or as a result of analysis and assessment.

These new resources may be directly related to other resources. As new resources are generated or new associations defined the network or collections formed will expand over time.

## 2.4. Conceptual System Environment

The data model is intended to enable the sharing of knowledge through structured metadata (SPASE Descriptions) which can be exchanged in queries and responses between systems. The operational environment this occurs in is the current Internet where systems and users are loosely coupled and highly distributed. Special services or portals may harvest (collect) the SPASE descriptions from multiple sources to create an enriched capability for the user. For example, a search engine may provide a comprehensive search for a particular scientific discipline. The web site <http://hpde.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 illustrates a conceptual architecture in a distributed environment. In this environment multiple communities have resources to share. The storage location of a resource is called a repository. Some of these repositories (boxes) have local SPASE descriptions which are available through a local registry service (balls). The contents of other repositories are described at external, possibly independent, locations which make the descriptions available through remote registries. Gateways (rings) can harvest and aggregate the resources from multiple registries or perform federated searches which provide a single access point to multiple registries. Applications access the registries to discover resources, determine their location and retrieve them from the repositories.



**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 (S).**

### 3. Guide to the SPASE Data Model

#### 3.1. Resource Types

The top level entity in the SPASE data model is a Resource. There are 12 different types of resources. Each resource type consists of a set of attributes that characterize the resource. The resource types can be divided into three categories: Data Resources, Origination Resources and Infrastructure Resources.

This section provides an overview of the resource types. Complete details for each resource can be found in Section 4.

##### 3.1.1. Data Resources

Data Resources describe one or more data products. A "data product" is a set of data that is uniformly processed and formatted, from one or more instruments, typically spanning the full duration of the observations of the relevant instrument(s). A data product may consist of a collection of granules of successive time spans, but may be high-level entities such as event catalogs. Data products can be images (Display Data), sample or observation values (Numerical Data), event lists (Catalog). Included in the Data Resource category are the resources used to describe individual files (Granule) which are part of data product sets and assessments of a resource (Annotations). The complete list of Data Resources is:

Numerical Data,  
Display Data,  
Catalog,  
Granule, and  
Annotation

### **3.1.2. Origination Resources**

Origination Resources describe the generators or sources of data. Included in a Data Resource description is information about the origination of the data. A Data Resource will refer to one or more Origination Resource. The complete list of Origination Resources is:

Observatory,  
Instrument,  
Person, and  
Document

### **3.1.3. Infrastructure Resources**

Infrastructure Resources describe system components that are part of the exchange and use of data. This includes storage locations for data (Repository), metadata (Registry) and functions (Service). The complete list of Infrastructure Resources is:

Registry,  
Repository, and  
Service

### **3.1.4. Ontology**

In the SPASE data model there can be associations between pairs of resources. Some associations are specific and are required in order to fully describe a resource. For example, an Instrument resource is always associated with an Observatory resource. The specific associations form an ontology which is illustrated in Figure 2. The SPASE data model also allows associations of resources which are not explicitly defined in the ontology. These associations are described and assigned a relationship type using generic association attributes.

# SPASE Ontology

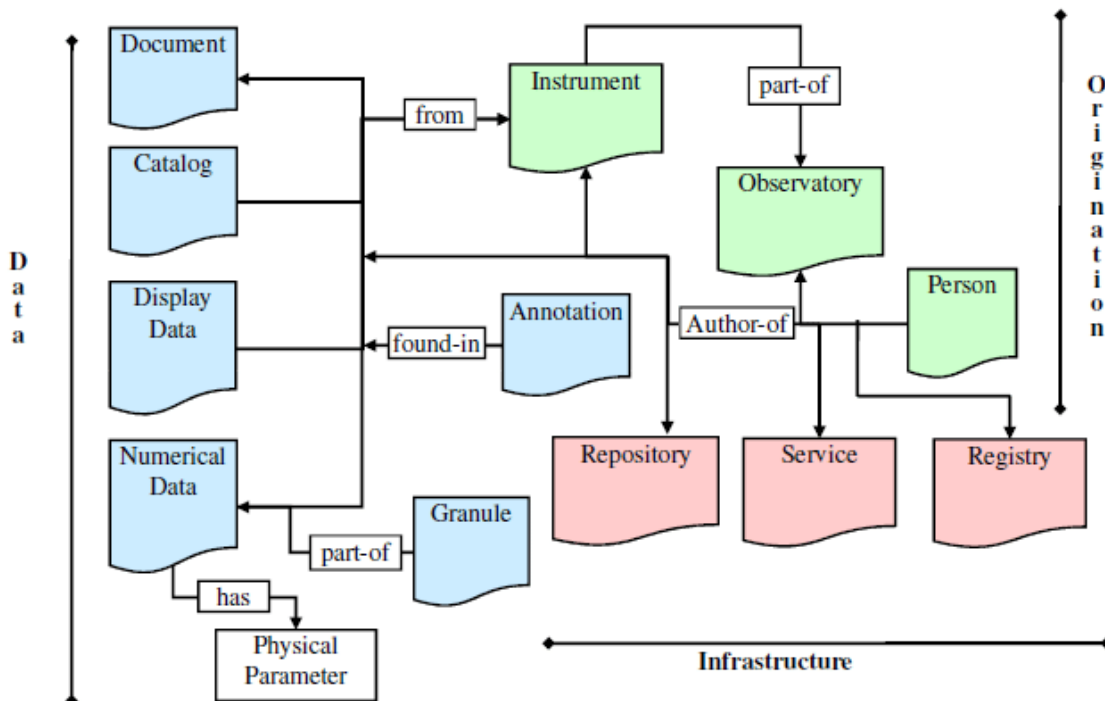


Figure 2: The association map between resources in the SPASE model. Arrows point in the direction of association.

## 3.2. Resource Identifiers

Every resource has a unique identifier so that it can be tracked and referenced within a system. This identifier is defined by the naming authority for the resource. The entity which acts as the naming authority is determined by the 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 naming authority within the data environment and "path" is the unique local identifier of the resource within the context of the "authority". The resource ID must be unique within the data environment.

To illustrate the definition of a resource identifier consider that there is a registered "authority" called "SMWG" which maintains information for spacecraft (Observatory) resources. One such spacecraft is GOES8. Now "SMWG" decides that the "path" to the GOES8 resource description should include the Resource Type as part of the path and that the observatory "name" will be "GOES8". So, the resource identifier would be:

spase://SMWG/Observatory/GOES8

The Resource ID is used to formally or informally associate one resource with another. For example an Instrument resource must be formally associated with an Observatory. A Numerical Data resource may be formally associated with an Instrument resource and informally associated with other Numerical Data resources. The free association of resources allows networks or collections to be formed from distributed resources and allows for new associations to be formed as needed without affecting existing associations.

### 3.3. Core Attributes

With the exception of Granule and Person, every resource has a common set of core attributes. The core attributes provide textual descriptions of the resource and the capability to reference external sources of information (Information URL). It also describes the context of the resource in the larger data environment. This context consists of associations with other resources (Association) and with previous versions (Prior ID). These attributes are grouped in a Resource Header and consists of:

- Resource Name
- Alternate Name
- Release Date
- Expiration Date
- Description
- Acknowledgement
- Contact
- Information URL
- Association
- Prior ID

### 3.4. Extensions

The SPASE Data Model allows for additional metadata to be embedded within a SPASE description. Every Resource Type has an "Extension" element which can contain metadata compliant with other data models. The "Extension" element has a SPASE data model type of "Text", but is not limited to alphanumeric characters and may contain tagged information.

### 3.5. Element Data Types

Each element in the SPASE Data Model has a data type. One design feature of the SPASE data model is that an element can contain either a value or other elements. Mixed content (elements and values) are not allowed. This allows the data model to be implemented in a wider range of metadata languages. The following data types are supported:

**Container** A container of other elements.

**Count** A whole number.

**DateTime** A value is given in the ISO 8601 recommended primary standard notation: YYYY-MM-DD, where YYYY is the year in the usual Gregorian calendar, MM is the month of the year between 01 (January) and 12 (December), and DD is the day of the month between 01 and 31. It may also have an optional time portion given in the ISO 8601 recommended primary standard notation: HH:MM:SS.sss where HH is the number of complete hours that have passed since midnight (00-24), MM is the number of complete minutes that have passed since the start of the hour (00-59), and SS is the number of complete seconds since the start of the minute (00-60), and sss are milliseconds that have passed since the start of the second (000-999). Time zones are not allowed so all times are in Universal Time. The time portion must follow the date portion with both portions separated by a "T". For example, "2004-07-29" is July 29, 2004 and "2004-07-29T12:30:00" is precisely 12:30 on July 29, 2004.

**Duration** A duration of time. A time value given in the ISO 8601 recommended primary standard notation: PTHH:MM:SS.sss where PT are tokens to indicate that the time value is a duration, HH is the number of complete hours that have passed since midnight (00-24), MM is the number of complete minutes that have passed since the start of the hour (00-59), and SS is the number of complete seconds since the start of the minute (00-60), and sss are milliseconds that have passed since the start of the second (000-999).

**Enumeration** Value is selected from a list of allowed values. The name of list is an additional attribute of the element. Lists may be externally controlled in which case the location of the list is indicated in the textual definition of the element.

**Item** An element which is a value for an enumerated list.

**Numeric** A fractional number which can be expressed in scientific notation. The string "NaN" represents not-a-number (flag) values and the string "INF" represents an infinitely large value. The value "-INF" represents an infinitely small value.

**Sequence** A list of whole number values where the order of the values is fixed. A space separates each value. For example, "1 2 3".

**Text** A string of alphanumeric characters. A text based "markup" is supported. See Text Mark-up section (3.4.1) for details.

**URL** Universal Resource Locator

### 3.5.1. Text Mark-up

While descriptive text may be brief, some formatting of the text may be necessary to convey the necessary information, for example, multiple paragraphs or nested lists. To ensure system portability text values in SPASE are sequences of alphanumeric one byte UTF-8 (US\_ASCII)

characters with white space preserved. When text is displayed in some applications (a web browser is the best example) a strict preservation of white space may not result in a desirable presentation. Also, to make the metadata more human readable (for example in XML) additional white space may be introduced in the form of indentation. If strictly preserved, this could result in an undesirable presentation. To allow an author to express a preferred layout for the text, a special set of text "mark-up" rules are defined. The layout can then be determined by normalizing the text and applying a simple set of interpretation rules.

### **3.5.1.1. Text Normalization Rules**

To aid in determining the layout or structural intent of the author the following rules are to be applied to text to create a normalized form:

1. All lines are to end with a newline character.
2. All text is left justified. No line has leading whitespace.

### **3.5.1.2. Text Interpretation Rules**

After normalization of text the following rules can be used to interpret the layout intent of the author.

1. Blank lines indicate paragraph breaks.
2. Lists
  - a. Must be preceded by a blank line.
  - b. Items are indicated by a line beginning with a reserved character followed by a space. Three levels of lists are supported. The reserved characters are:
    - \* : First level list
    - : Second level list (must appear within a first level context)
    - . : Third level list (must appear within a second level context)
  - c. End with a blank line.
3. Tables
  - a. Begin and end with a line that starts with "+--".
  - b. The first "row" of a table is the field headings.
  - c. Fields in a table are separated with a vertical bar ("|").
  - d. Visual row separators are lines which begin with "|--".

#### 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: Occurrence specifications are enclosed in parenthesis: 0 = optional, 1 = required, \* = zero or more, + = 1 or more

```

+ Spase (1)
|   + Version (1)
|   + Catalog (+ of A)
|     + ResourceID (1)
|     + ResourceHeader (1)
|       + ResourceName (1)
|       + AlternateName (*)
|       + ReleaseDate (1)
|       + ExpirationDate (0)
|       + Description (1)
|       + Acknowledgement (0)
|       + Contact (+)
|         + PersonID (1)
|         + Role (+)
|       + InformationURL (*)
|         + Name (0)
|         + URL (1)
|         + Description (0)
|         + Language (0)
|       + Association (*)
|         + AssociationID (1)
|         + AssociationType (1)
|         + Note (0)
|       + PriorID (*)
|     + AccessInformation (+)
|       + RepositoryID (1)
|       + Availability (0)
|       + AccessRights (0)
|       + AccessURL (+)
|         + Name (0)
|         + URL (1)
|         + ProductKey (*)
|         + Description (0)
|         + Language (0)
|       + Format (1)
|       + Encoding (0)
|       + DataExtent (0)
|         + Quantity (1)
|         + Units (0)
|         + Per (0)
|       + Acknowledgement (0)
|     + ProviderName (0)

```



|  |                                |
|--|--------------------------------|
|  | + ProviderResourceName (0)     |
|  | + ProviderVersion (0)          |
|  | + InstrumentID (*)             |
|  | + PhenomenonType (+)           |
|  | + TimeSpan (0)                 |
|  | + StartDate (1)                |
|  | + StopDate (1 of B)            |
|  | + RelativeStopDate (1 of B)    |
|  | + Note (*)                     |
|  | + Caveats (0)                  |
|  | + Keyword (*)                  |
|  | + InputResourceID (*)          |
|  | + Parameter (*)                |
|  | + Name (1)                     |
|  | + Set (*)                      |
|  | + ParameterKey (0)             |
|  | + Description (0)              |
|  | + UCD (0)                      |
|  | + Caveats (0)                  |
|  | + Cadence (0)                  |
|  | + CadenceMin (0)               |
|  | + CadenceMax (0)               |
|  | + Units (0)                    |
|  | + UnitsConversion (0)          |
|  | + CoordinateSystem (0)         |
|  | + CoordinateRepresentation (1) |
|  | + CoordinateSystemName (1)     |
|  | + RenderingHints (*)           |
|  | + DisplayType (0)              |
|  | + AxisLabel (0)                |
|  | + RenderingAxis (0)            |
|  | + Index (0)                    |
|  | + ValueFormat (0)              |
|  | + ScaleMin (0)                 |
|  | + ScaleMax (0)                 |
|  | + ScaleType (0)                |
|  | + Structure (0)                |
|  | + Size (1)                     |
|  | + Description (0)              |
|  | + Element (*)                  |
|  | + Name (1)                     |
|  | + Qualifier (*)                |
|  | + Index (1)                    |
|  | + ParameterKey (0)             |
|  | + Units (0)                    |
|  | + UnitsConversion (0)          |
|  | + ValidMin (0)                 |
|  | + ValidMax (0)                 |
|  | + FillValue (0)                |
|  | + RenderingHints (0)           |
|  | + DisplayType (0)              |

|  |  |  |  |  |                           |                     |
|--|--|--|--|--|---------------------------|---------------------|
|  |  |  |  |  |                           | + AxisLabel (0)     |
|  |  |  |  |  |                           | + RenderingAxis (0) |
|  |  |  |  |  |                           | + Index (0)         |
|  |  |  |  |  |                           | + ValueFormat (0)   |
|  |  |  |  |  |                           | + ScaleMin (0)      |
|  |  |  |  |  |                           | + ScaleMax (0)      |
|  |  |  |  |  |                           | + ScaleType (0)     |
|  |  |  |  |  | + ValidMin (0)            |                     |
|  |  |  |  |  | + ValidMax (0)            |                     |
|  |  |  |  |  | + FillValue (0)           |                     |
|  |  |  |  |  | + Field (1 of C)          |                     |
|  |  |  |  |  | + Qualifier (*)           |                     |
|  |  |  |  |  | + FieldQuantity (1)       |                     |
|  |  |  |  |  | + FrequencyRange (0)      |                     |
|  |  |  |  |  | + SpectralRange (0)       |                     |
|  |  |  |  |  | + Low (1)                 |                     |
|  |  |  |  |  | + High (1)                |                     |
|  |  |  |  |  | + Units (1)               |                     |
|  |  |  |  |  | + Bin (*)                 |                     |
|  |  |  |  |  | + BandName (0)            |                     |
|  |  |  |  |  | + Low (1)                 |                     |
|  |  |  |  |  | + High (1)                |                     |
|  |  |  |  |  | + Particle (1 of C)       |                     |
|  |  |  |  |  | + ParticleType (*)        |                     |
|  |  |  |  |  | + Qualifier (*)           |                     |
|  |  |  |  |  | + ParticleQuantity (1)    |                     |
|  |  |  |  |  | + AtomicNumber (*)        |                     |
|  |  |  |  |  | + EnergyRange (0)         |                     |
|  |  |  |  |  | + Low (1)                 |                     |
|  |  |  |  |  | + High (1)                |                     |
|  |  |  |  |  | + Units (1)               |                     |
|  |  |  |  |  | + Bin (*)                 |                     |
|  |  |  |  |  | + BandName (0)            |                     |
|  |  |  |  |  | + Low (1)                 |                     |
|  |  |  |  |  | + High (1)                |                     |
|  |  |  |  |  | + AzimuthalAngleRange (0) |                     |
|  |  |  |  |  | + Low (1)                 |                     |
|  |  |  |  |  | + High (1)                |                     |
|  |  |  |  |  | + Units (1)               |                     |
|  |  |  |  |  | + Bin (*)                 |                     |
|  |  |  |  |  | + BandName (0)            |                     |
|  |  |  |  |  | + Low (1)                 |                     |
|  |  |  |  |  | + High (1)                |                     |
|  |  |  |  |  | + PolarAngleRange (0)     |                     |
|  |  |  |  |  | + Low (1)                 |                     |
|  |  |  |  |  | + High (1)                |                     |
|  |  |  |  |  | + Units (1)               |                     |
|  |  |  |  |  | + Bin (*)                 |                     |
|  |  |  |  |  | + BandName (0)            |                     |
|  |  |  |  |  | + Low (1)                 |                     |
|  |  |  |  |  | + High (1)                |                     |

|  |  |  |  |  |                       |
|--|--|--|--|--|-----------------------|
|  |  |  |  |  | + MassRange (0)       |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + PitchAngleRange (0) |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Wave (1 of C)       |
|  |  |  |  |  | + WaveType (0)        |
|  |  |  |  |  | + Qualifier (*)       |
|  |  |  |  |  | + WaveQuantity (1)    |
|  |  |  |  |  | + EnergyRange (0)     |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + FrequencyRange (0)  |
|  |  |  |  |  | + SpectralRange (0)   |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + WavelengthRange (0) |
|  |  |  |  |  | + SpectralRange (0)   |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Mixed (1 of C)      |
|  |  |  |  |  | + MixedQuantity (1)   |
|  |  |  |  |  | + ParticleType (*)    |
|  |  |  |  |  | + Qualifier (*)       |
|  |  |  |  |  | + Support (1 of C)    |

```

|         |         |         |         + Qualifier (*)
|         |         |         |         + SupportQuantity (1)
|         |         |         |         + Extension (*)
|         |         |         |         + DisplayData (+ of A)
|         |         |         |         + ResourceID (1)
|         |         |         |         + ResourceHeader (1)
|         |         |         |         + ResourceName (1)
|         |         |         |         + AlternateName (*)
|         |         |         |         + ReleaseDate (1)
|         |         |         |         + ExpirationDate (0)
|         |         |         |         + Description (1)
|         |         |         |         + Acknowledgement (0)
|         |         |         |         + Contact (+)
|         |         |         |         |         + PersonID (1)
|         |         |         |         |         + Role (+)
|         |         |         |         + InformationURL (*)
|         |         |         |         |         + Name (0)
|         |         |         |         |         + URL (1)
|         |         |         |         |         + Description (0)
|         |         |         |         |         + Language (0)
|         |         |         |         + Association (*)
|         |         |         |         |         + AssociationID (1)
|         |         |         |         |         + AssociationType (1)
|         |         |         |         |         + Note (0)
|         |         |         |         + PriorID (*)
|         |         |         |         + AccessInformation (+)
|         |         |         |         |         + RepositoryID (1)
|         |         |         |         |         + Availability (0)
|         |         |         |         |         + AccessRights (0)
|         |         |         |         |         + AccessURL (+)
|         |         |         |         |         |         + Name (0)
|         |         |         |         |         |         + URL (1)
|         |         |         |         |         |         + ProductKey (*)
|         |         |         |         |         |         + Description (0)
|         |         |         |         |         |         + Language (0)
|         |         |         |         |         + Format (1)
|         |         |         |         |         + Encoding (0)
|         |         |         |         |         + DataExtent (0)
|         |         |         |         |         |         + Quantity (1)
|         |         |         |         |         |         + Units (0)
|         |         |         |         |         |         + Per (0)
|         |         |         |         |         + Acknowledgement (0)
|         |         |         |         + ProcessingLevel (0)
|         |         |         |         + ProviderName (0)
|         |         |         |         + ProviderResourceName (0)
|         |         |         |         + ProviderProcessingLevel (0)
|         |         |         |         + ProviderVersion (0)
|         |         |         |         + InstrumentID (*)
|         |         |         |         + MeasurementType (+)
|         |         |         |         + TemporalDescription (0)
|         |         |         |         |         + TimeSpan (1)

```

|  |  |                                |                             |
|--|--|--------------------------------|-----------------------------|
|  |  |                                | + StartDate (1)             |
|  |  |                                | + StopDate (1 of B)         |
|  |  |                                | + RelativeStopDate (1 of B) |
|  |  |                                | + Note (*)                  |
|  |  | + Cadence (0)                  |                             |
|  |  | + CadenceMin (0)               |                             |
|  |  | + CadenceMax (0)               |                             |
|  |  | + Exposure (0)                 |                             |
|  |  | + ExposureMin (0)              |                             |
|  |  | + ExposureMax (0)              |                             |
|  |  | + SpectralRange (*)            |                             |
|  |  | + DisplayCadence (0)           |                             |
|  |  | + ObservedRegion (*)           |                             |
|  |  | + Caveats (0)                  |                             |
|  |  | + Keyword (*)                  |                             |
|  |  | + InputResourceID (*)          |                             |
|  |  | + Parameter (*)                |                             |
|  |  | + Name (1)                     |                             |
|  |  | + Set (*)                      |                             |
|  |  | + ParameterKey (0)             |                             |
|  |  | + Description (0)              |                             |
|  |  | + UCD (0)                      |                             |
|  |  | + Caveats (0)                  |                             |
|  |  | + Cadence (0)                  |                             |
|  |  | + CadenceMin (0)               |                             |
|  |  | + CadenceMax (0)               |                             |
|  |  | + Units (0)                    |                             |
|  |  | + UnitsConversion (0)          |                             |
|  |  | + CoordinateSystem (0)         |                             |
|  |  | + CoordinateRepresentation (1) |                             |
|  |  | + CoordinateSystemName (1)     |                             |
|  |  | + RenderingHints (*)           |                             |
|  |  | + DisplayType (0)              |                             |
|  |  | + AxisLabel (0)                |                             |
|  |  | + RenderingAxis (0)            |                             |
|  |  | + Index (0)                    |                             |
|  |  | + ValueFormat (0)              |                             |
|  |  | + ScaleMin (0)                 |                             |
|  |  | + ScaleMax (0)                 |                             |
|  |  | + ScaleType (0)                |                             |
|  |  | + Structure (0)                |                             |
|  |  | + Size (1)                     |                             |
|  |  | + Description (0)              |                             |
|  |  | + Element (*)                  |                             |
|  |  | + Name (1)                     |                             |
|  |  | + Qualifier (*)                |                             |
|  |  | + Index (1)                    |                             |
|  |  | + ParameterKey (0)             |                             |
|  |  | + Units (0)                    |                             |
|  |  | + UnitsConversion (0)          |                             |
|  |  | + ValidMin (0)                 |                             |

|  |  |  |  |  |                           |
|--|--|--|--|--|---------------------------|
|  |  |  |  |  | + ValidMax (0)            |
|  |  |  |  |  | + FillValue (0)           |
|  |  |  |  |  | + RenderingHints (0)      |
|  |  |  |  |  | + DisplayType (0)         |
|  |  |  |  |  | + AxisLabel (0)           |
|  |  |  |  |  | + RenderingAxis (0)       |
|  |  |  |  |  | + Index (0)               |
|  |  |  |  |  | + ValueFormat (0)         |
|  |  |  |  |  | + ScaleMin (0)            |
|  |  |  |  |  | + ScaleMax (0)            |
|  |  |  |  |  | + ScaleType (0)           |
|  |  |  |  |  | + ValidMin (0)            |
|  |  |  |  |  | + ValidMax (0)            |
|  |  |  |  |  | + FillValue (0)           |
|  |  |  |  |  | + Field (1 of C)          |
|  |  |  |  |  | + Qualifier (*)           |
|  |  |  |  |  | + FieldQuantity (1)       |
|  |  |  |  |  | + FrequencyRange (0)      |
|  |  |  |  |  | + SpectralRange (0)       |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Units (1)               |
|  |  |  |  |  | + Bin (*)                 |
|  |  |  |  |  | + BandName (0)            |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Particle (1 of C)       |
|  |  |  |  |  | + ParticleType (*)        |
|  |  |  |  |  | + Qualifier (*)           |
|  |  |  |  |  | + ParticleQuantity (1)    |
|  |  |  |  |  | + AtomicNumber (*)        |
|  |  |  |  |  | + EnergyRange (0)         |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Units (1)               |
|  |  |  |  |  | + Bin (*)                 |
|  |  |  |  |  | + BandName (0)            |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + AzimuthalAngleRange (0) |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Units (1)               |
|  |  |  |  |  | + Bin (*)                 |
|  |  |  |  |  | + BandName (0)            |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + PolarAngleRange (0)     |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Units (1)               |

|  |  |  |  |  |                       |
|--|--|--|--|--|-----------------------|
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + MassRange (0)       |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + PitchAngleRange (0) |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Wave (1 of C)       |
|  |  |  |  |  | + WaveType (0)        |
|  |  |  |  |  | + Qualifier (*)       |
|  |  |  |  |  | + WaveQuantity (1)    |
|  |  |  |  |  | + EnergyRange (0)     |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + FrequencyRange (0)  |
|  |  |  |  |  | + SpectralRange (0)   |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + WavelengthRange (0) |
|  |  |  |  |  | + SpectralRange (0)   |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Units (1)           |
|  |  |  |  |  | + Bin (*)             |
|  |  |  |  |  | + BandName (0)        |
|  |  |  |  |  | + Low (1)             |
|  |  |  |  |  | + High (1)            |
|  |  |  |  |  | + Mixed (1 of C)      |

|  |                               |                       |                       |
|--|-------------------------------|-----------------------|-----------------------|
|  |                               |                       | + MixedQuantity (1)   |
|  |                               |                       | + ParticleType (*)    |
|  |                               |                       | + Qualifier (*)       |
|  |                               | + Support (1 of C)    |                       |
|  |                               |                       | + Qualifier (*)       |
|  |                               |                       | + SupportQuantity (1) |
|  |                               | + Extension (*)       |                       |
|  | + NumericalData (+ of A)      |                       |                       |
|  |                               | + ResourceID (1)      |                       |
|  |                               | + ResourceHeader (1)  |                       |
|  |                               |                       | + ResourceName (1)    |
|  |                               |                       | + AlternateName (*)   |
|  |                               |                       | + ReleaseDate (1)     |
|  |                               |                       | + ExpirationDate (0)  |
|  |                               |                       | + Description (1)     |
|  |                               |                       | + Acknowledgement (0) |
|  |                               | + Contact (+)         |                       |
|  |                               |                       | + PersonID (1)        |
|  |                               |                       | + Role (+)            |
|  |                               | + InformationURL (*)  |                       |
|  |                               |                       | + Name (0)            |
|  |                               |                       | + URL (1)             |
|  |                               |                       | + Description (0)     |
|  |                               |                       | + Language (0)        |
|  |                               | + Association (*)     |                       |
|  |                               |                       | + AssociationID (1)   |
|  |                               |                       | + AssociationType (1) |
|  |                               |                       | + Note (0)            |
|  |                               | + PriorID (*)         |                       |
|  | + AccessInformation (+)       |                       |                       |
|  |                               | + RepositoryID (1)    |                       |
|  |                               | + Availability (0)    |                       |
|  |                               | + AccessRights (0)    |                       |
|  |                               | + AccessURL (+)       |                       |
|  |                               |                       | + Name (0)            |
|  |                               |                       | + URL (1)             |
|  |                               |                       | + ProductKey (*)      |
|  |                               |                       | + Description (0)     |
|  |                               |                       | + Language (0)        |
|  |                               | + Format (1)          |                       |
|  |                               | + Encoding (0)        |                       |
|  |                               | + DataExtent (0)      |                       |
|  |                               |                       | + Quantity (1)        |
|  |                               |                       | + Units (0)           |
|  |                               |                       | + Per (0)             |
|  |                               | + Acknowledgement (0) |                       |
|  | + ProcessingLevel (0)         |                       |                       |
|  | + ProviderName (0)            |                       |                       |
|  | + ProviderResourceName (0)    |                       |                       |
|  | + ProviderProcessingLevel (0) |                       |                       |
|  | + ProviderVersion (0)         |                       |                       |



|  |                                |
|--|--------------------------------|
|  | + InstrumentID (*)             |
|  | + MeasurementType (+)          |
|  | + TemporalDescription (0)      |
|  | + TimeSpan (1)                 |
|  | + StartDate (1)                |
|  | + StopDate (1 of B)            |
|  | + RelativeStopDate (1 of B)    |
|  | + Note (*)                     |
|  | + Cadence (0)                  |
|  | + CadenceMin (0)               |
|  | + CadenceMax (0)               |
|  | + Exposure (0)                 |
|  | + ExposureMin (0)              |
|  | + ExposureMax (0)              |
|  | + SpectralRange (*)            |
|  | + ObservedRegion (*)           |
|  | + Caveats (0)                  |
|  | + Keyword (*)                  |
|  | + InputResourceID (*)          |
|  | + Parameter (*)                |
|  | + Name (1)                     |
|  | + Set (*)                      |
|  | + ParameterKey (0)             |
|  | + Description (0)              |
|  | + UCD (0)                      |
|  | + Caveats (0)                  |
|  | + Cadence (0)                  |
|  | + CadenceMin (0)               |
|  | + CadenceMax (0)               |
|  | + Units (0)                    |
|  | + UnitsConversion (0)          |
|  | + CoordinateSystem (0)         |
|  | + CoordinateRepresentation (1) |
|  | + CoordinateSystemName (1)     |
|  | + RenderingHints (*)           |
|  | + DisplayType (0)              |
|  | + AxisLabel (0)                |
|  | + RenderingAxis (0)            |
|  | + Index (0)                    |
|  | + ValueFormat (0)              |
|  | + ScaleMin (0)                 |
|  | + ScaleMax (0)                 |
|  | + ScaleType (0)                |
|  | + Structure (0)                |
|  | + Size (1)                     |
|  | + Description (0)              |
|  | + Element (*)                  |
|  | + Name (1)                     |
|  | + Qualifier (*)                |
|  | + Index (1)                    |
|  | + ParameterKey (0)             |

|  |  |  |  |  |                           |
|--|--|--|--|--|---------------------------|
|  |  |  |  |  | + Units (0)               |
|  |  |  |  |  | + UnitsConversion (0)     |
|  |  |  |  |  | + ValidMin (0)            |
|  |  |  |  |  | + ValidMax (0)            |
|  |  |  |  |  | + FillValue (0)           |
|  |  |  |  |  | + RenderingHints (0)      |
|  |  |  |  |  | + DisplayType (0)         |
|  |  |  |  |  | + AxisLabel (0)           |
|  |  |  |  |  | + RenderingAxis (0)       |
|  |  |  |  |  | + Index (0)               |
|  |  |  |  |  | + ValueFormat (0)         |
|  |  |  |  |  | + ScaleMin (0)            |
|  |  |  |  |  | + ScaleMax (0)            |
|  |  |  |  |  | + ScaleType (0)           |
|  |  |  |  |  | + ValidMin (0)            |
|  |  |  |  |  | + ValidMax (0)            |
|  |  |  |  |  | + FillValue (0)           |
|  |  |  |  |  | + Field (1 of C)          |
|  |  |  |  |  | + Qualifier (*)           |
|  |  |  |  |  | + FieldQuantity (1)       |
|  |  |  |  |  | + FrequencyRange (0)      |
|  |  |  |  |  | + SpectralRange (0)       |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Units (1)               |
|  |  |  |  |  | + Bin (*)                 |
|  |  |  |  |  | + BandName (0)            |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Particle (1 of C)       |
|  |  |  |  |  | + ParticleType (*)        |
|  |  |  |  |  | + Qualifier (*)           |
|  |  |  |  |  | + ParticleQuantity (1)    |
|  |  |  |  |  | + AtomicNumber (*)        |
|  |  |  |  |  | + EnergyRange (0)         |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Units (1)               |
|  |  |  |  |  | + Bin (*)                 |
|  |  |  |  |  | + BandName (0)            |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + AzimuthalAngleRange (0) |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + Units (1)               |
|  |  |  |  |  | + Bin (*)                 |
|  |  |  |  |  | + BandName (0)            |
|  |  |  |  |  | + Low (1)                 |
|  |  |  |  |  | + High (1)                |
|  |  |  |  |  | + PolarAngleRange (0)     |

|  |  |  |  |                       |                     |
|--|--|--|--|-----------------------|---------------------|
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  |                       | + Units (1)         |
|  |  |  |  |                       | + Bin (*)           |
|  |  |  |  |                       | + BandName (0)      |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  | + MassRange (0)       |                     |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  |                       | + Units (1)         |
|  |  |  |  |                       | + Bin (*)           |
|  |  |  |  |                       | + BandName (0)      |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  | + PitchAngleRange (0) |                     |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  |                       | + Units (1)         |
|  |  |  |  |                       | + Bin (*)           |
|  |  |  |  |                       | + BandName (0)      |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  | + Wave (1 of C)       |                     |
|  |  |  |  |                       | + WaveType (0)      |
|  |  |  |  |                       | + Qualifier (*)     |
|  |  |  |  |                       | + WaveQuantity (1)  |
|  |  |  |  |                       | + EnergyRange (0)   |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  |                       | + Units (1)         |
|  |  |  |  |                       | + Bin (*)           |
|  |  |  |  |                       | + BandName (0)      |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  | + FrequencyRange (0)  |                     |
|  |  |  |  |                       | + SpectralRange (0) |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  |                       | + Units (1)         |
|  |  |  |  |                       | + Bin (*)           |
|  |  |  |  |                       | + BandName (0)      |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  | + WavelengthRange (0) |                     |
|  |  |  |  |                       | + SpectralRange (0) |
|  |  |  |  |                       | + Low (1)           |
|  |  |  |  |                       | + High (1)          |
|  |  |  |  |                       | + Units (1)         |
|  |  |  |  |                       | + Bin (*)           |
|  |  |  |  |                       | + BandName (0)      |



```

|      |      + MIMEType (1)
|      |      + InputResourceID (*)
| + Granule (+ of A)
|      |      + ResourceID (1)
|      |      + ReleaseDate (1)
|      |      + ExpirationDate (0)
|      |      + ParentID (1)
|      |      + PriorID (*)
|      |      + StartDate (1)
|      |      + StopDate (1)
|      |      + Source (+)
|      |      |      + SourceType (1)
|      |      |      + URL (1)
|      |      |      + MirrorURL (*)
|      |      |      + Checksum (0)
|      |      |      |      + HashValue (1)
|      |      |      |      + HashFunction (1)
|      |      |      + DataExtent (0)
|      |      |      |      + Quantity (1)
|      |      |      |      + Units (0)
|      |      |      |      + Per (0)
| + Instrument (+ of A)
|      |      + ResourceID (1)
|      |      + ResourceHeader (1)
|      |      |      + ResourceName (1)
|      |      |      + AlternateName (*)
|      |      |      + ReleaseDate (1)
|      |      |      + ExpirationDate (0)
|      |      |      + Description (1)
|      |      |      + Acknowledgement (0)
|      |      |      + Contact (+)
|      |      |      |      + PersonID (1)
|      |      |      |      + Role (+)
|      |      |      + InformationURL (*)
|      |      |      |      + Name (0)
|      |      |      |      + URL (1)
|      |      |      |      + Description (0)
|      |      |      |      + Language (0)
|      |      |      + Association (*)
|      |      |      |      + AssociationID (1)
|      |      |      |      + AssociationType (1)
|      |      |      |      + Note (0)
|      |      |      + PriorID (*)
|      |      + InstrumentType (+)
|      |      + InvestigationName (+)
|      |      + OperatingSpan (0)
|      |      |      + StartDate (1)
|      |      |      + StopDate (0)
|      |      |      + Note (*)
|      |      + ObservatoryID (1)
|      |      + Caveats (0)

```

```

|      |      + Extension (*)
| + Observatory (+ of A)
|      |      + ResourceID (1)
|      |      + ResourceHeader (1)
|      |          + ResourceName (1)
|      |          + AlternateName (*)
|      |          + ReleaseDate (1)
|      |          + ExpirationDate (0)
|      |          + Description (1)
|      |          + Acknowledgement (0)
|      |          + Contact (+)
|      |              + PersonID (1)
|      |              + Role (+)
|      |          + InformationURL (*)
|      |              + Name (0)
|      |              + URL (1)
|      |              + Description (0)
|      |              + Language (0)
|      |          + Association (*)
|      |              + AssociationID (1)
|      |              + AssociationType (1)
|      |              + Note (0)
|      |          + PriorID (*)
|      |      + ObservatoryGroupID (*)
|      |      + Location (1)
|      |          + ObservatoryRegion (+)
|      |          + CoordinateSystemName (0)
|      |          + Latitude (0)
|      |          + Longitude (0)
|      |          + Elevation (0)
|      |      + OperatingSpan (+)
|      |          + StartDate (1)
|      |          + StopDate (0)
|      |          + Note (*)
|      |      + Extension (*)
| + Person (+ of A)
|      |      + ResourceID (1)
|      |      + ReleaseDate (0)
|      |      + PersonName (0)
|      |      + OrganizationName (1)
|      |      + Address (0)
|      |      + Email (*)
|      |      + PhoneNumber (*)
|      |      + FaxNumber (0)
|      |      + Note (0)
|      |      + Extension (*)
| + Registry (+ of A)
|      |      + ResourceID (1)
|      |      + ResourceHeader (1)
|      |          + ResourceName (1)
|      |          + AlternateName (*)

```

|  |                       |                       |
|--|-----------------------|-----------------------|
|  |                       | + ReleaseDate (1)     |
|  |                       | + ExpirationDate (0)  |
|  |                       | + Description (1)     |
|  |                       | + Acknowledgement (0) |
|  |                       | + Contact (+)         |
|  |                       | + PersonID (1)        |
|  |                       | + Role (+)            |
|  |                       | + InformationURL (*)  |
|  |                       | + Name (0)            |
|  |                       | + URL (1)             |
|  |                       | + Description (0)     |
|  |                       | + Language (0)        |
|  |                       | + Association (*)     |
|  |                       | + AssociationID (1)   |
|  |                       | + AssociationType (1) |
|  |                       | + Note (0)            |
|  |                       | + PriorID (*)         |
|  | + AccessURL (1)       |                       |
|  |                       | + Name (0)            |
|  |                       | + URL (1)             |
|  |                       | + ProductKey (*)      |
|  |                       | + Description (0)     |
|  |                       | + Language (0)        |
|  | + Extension (*)       |                       |
|  | + Repository (+ of A) |                       |
|  |                       | + ResourceID (1)      |
|  |                       | + ResourceHeader (1)  |
|  |                       | + ResourceName (1)    |
|  |                       | + AlternateName (*)   |
|  |                       | + ReleaseDate (1)     |
|  |                       | + ExpirationDate (0)  |
|  |                       | + Description (1)     |
|  |                       | + Acknowledgement (0) |
|  |                       | + Contact (+)         |
|  |                       | + PersonID (1)        |
|  |                       | + Role (+)            |
|  |                       | + InformationURL (*)  |
|  |                       | + Name (0)            |
|  |                       | + URL (1)             |
|  |                       | + Description (0)     |
|  |                       | + Language (0)        |
|  |                       | + Association (*)     |
|  |                       | + AssociationID (1)   |
|  |                       | + AssociationType (1) |
|  |                       | + Note (0)            |
|  |                       | + PriorID (*)         |
|  | + AccessURL (1)       |                       |
|  |                       | + Name (0)            |
|  |                       | + URL (1)             |
|  |                       | + ProductKey (*)      |
|  |                       | + Description (0)     |

|  |                       |                       |
|--|-----------------------|-----------------------|
|  |                       | + Language (0)        |
|  |                       | + Extension (*)       |
|  | + Service (+ of A)    |                       |
|  |                       | + ResourceID (1)      |
|  |                       | + ResourceHeader (1)  |
|  |                       | + ResourceName (1)    |
|  |                       | + AlternateName (*)   |
|  |                       | + ReleaseDate (1)     |
|  |                       | + ExpirationDate (0)  |
|  |                       | + Description (1)     |
|  |                       | + Acknowledgement (0) |
|  |                       | + Contact (+)         |
|  |                       | + PersonID (1)        |
|  |                       | + Role (+)            |
|  |                       | + InformationURL (*)  |
|  |                       | + Name (0)            |
|  |                       | + URL (1)             |
|  |                       | + Description (0)     |
|  |                       | + Language (0)        |
|  |                       | + Association (*)     |
|  |                       | + AssociationID (1)   |
|  |                       | + AssociationType (1) |
|  |                       | + Note (0)            |
|  |                       | + PriorID (*)         |
|  | + AccessURL (1)       |                       |
|  |                       | + Name (0)            |
|  |                       | + URL (1)             |
|  |                       | + ProductKey (*)      |
|  |                       | + Description (0)     |
|  |                       | + Language (0)        |
|  |                       | + Extension (*)       |
|  | + Annotation (+ of A) |                       |
|  |                       | + ResourceID (1)      |
|  |                       | + ResourceHeader (1)  |
|  |                       | + ResourceName (1)    |
|  |                       | + AlternateName (*)   |
|  |                       | + ReleaseDate (1)     |
|  |                       | + ExpirationDate (0)  |
|  |                       | + Description (1)     |
|  |                       | + Acknowledgement (0) |
|  |                       | + Contact (+)         |
|  |                       | + PersonID (1)        |
|  |                       | + Role (+)            |
|  |                       | + InformationURL (*)  |
|  |                       | + Name (0)            |
|  |                       | + URL (1)             |
|  |                       | + Description (0)     |
|  |                       | + Language (0)        |
|  |                       | + Association (*)     |
|  |                       | + AssociationID (1)   |
|  |                       | + AssociationType (1) |



```

|   |   |   |   + Note (0)
|   |   |   + PriorID (*)
|   |   + ImageURL (0)
|   |   + AnnotationType (1)
|   |   + PhenomenonType (0)
|   |   + ClassificationMethod (0)
|   |   + ConfidenceRating (0)
|   |   + TimeSpan (*)
|   |   |   + StartDate (1)
|   |   |   + StopDate (1 of B)
|   |   |   + RelativeStopDate (1 of B)
|   |   |   + Note (*)
|   |   + ObservationExtent (*)
|   |   |   + ObservedRegion (0)
|   |   |   + StartLocation (1)
|   |   |   + StopLocation (1)
|   |   |   + Note (*)
|   |   + 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 necessary 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 of the data, 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. Also consider if additional documentation is necessary and if so create an Document resource and associate it with the data resource. An "Information URL" may also be used to provide links to more detailed information.

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 version="1.0" encoding="UTF-8" ?>
<Spase>
  <Version>2.0.0</Version>
  <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 version="1.0" encoding="UTF-8" ?>
<Spase>
  <Version>2.0.0</Version>
  <NumericalData>
    <ResourceID>spase://VMO/NumericalData/ACE/MAG/200301</ResourceID>
    <ResourceHeader>
      <ResourceName>ACEMAG200301</ResourceName>
      <ReleaseDate>2006-07-26T00:00:00.000</ReleaseDate>
      <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>PrincipalInvestigator</Role>
        <PersonID>spase://SMWG/Person/Norman.F.Ness</PersonID>
      </Contact>
      <Contact>
        <Role>Co-Investigator</Role>
        <PersonID>spase://SMWG/Person/Charles.Smith</PersonID>
      </Contact>
      <Contact>
        <Role>DataProducer</Role>

```

```

        <PresonID>spase://SMWG/Person/James.M.Weygand</PresonID>
    </Contact>
</ResourceHeader>

<AccessInformation>
    <AccessRights>Open</AccessRights>
    <AccessURL>

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

<InstrumentID>spase://SMWG/ACE/MAG</InstrumentID>
<MeasurementType>MagneticField</MeasurementType>

<TemporalDescription>
    <TimeSpan>
        <StartDate>1997-01-01T00:00</StartDate>
        <StopDate>2004-01-31T23:59</StopDate>
    </TimeSpan>
    <Cadence>PT1M</Cadence>
</TemporalDescription>

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

<Parameter>
    <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>
        <SupportQuantity>Temporal</SupportQuantity>
    </Support>
</Parameter>

<Parameter>
    <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>
    <Field>
        <Qualifier>Vector</Qualifier>
        <FieldQuantity>Magnetic</FieldQuantity>
    </Field>
</Parameter>

<Parameter>
    <Name>SPACECRAFT_POSITION_VECTOR</Name>

```

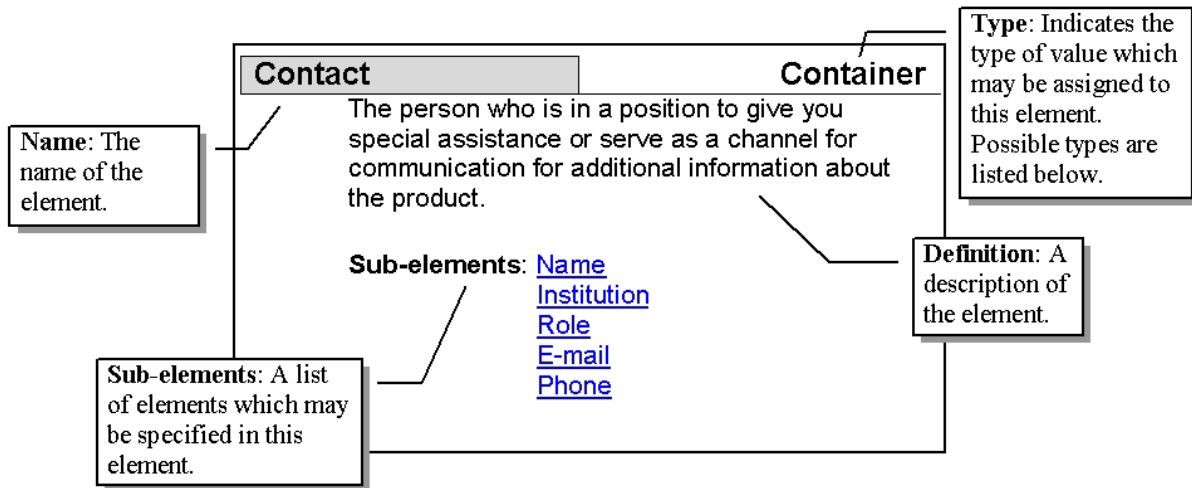
```
<CoordinateSystem>
  <CoordinateRepresentation>Cartesian</CoordinateRepresentation>
  <CoordinateSystemName>GSE</CoordinateSystemName>
</CoordinateSystem>
<Units>EARTH RADII</Units>
<UnitsConversion>6378.16 km</UnitsConversion>
<Description>
  ACE spacecraft location in GSE coordinates (X,Y,Z)."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

</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:



|   |             |
|---|-------------|
| <b>ACElectricField</b>  | Item        |
| Alternating electric field component of a wave.   |             |
| <b>ACMagneticField</b>  | Item        |
| Alternating magnetic field component of a wave.   |             |
| <b>ASCII</b>  | Item        |
| A sequence of characters that adheres to American Standard Code for Information Interchange (ASCII) which is an 7-bit character-coding scheme.                      |             |
| <b>AVI</b>  | Item        |
| Audio Video Interleave (AVI) a digital format for movies that conforms to the Microsoft Windows Resource Interchange File Format (RIFF).                            |             |
| <b>Absorption</b>   | Item        |
| Decrease of radiant energy (relative to the background continuum spectrum).   |             |
| <b>AccessInformation</b>  | Container   |
| Attributes of the resource which pertain to how to accessing the resource, availability and storage format.   |             |
| Sub-elements:   |             |
| AccessRights  |             |
| AccessURL   |             |
| Acknowledgement   |             |
| Availability  |             |
| DataExtent  |             |
| Encoding  |             |
| Format  |             |
| RepositoryID  |             |
| <b>AccessRights</b>   | Enumeration |
| Permissions granted or denied by the host of a product to allow other users to access and use the resource.   |             |
| Allowed Values:   |             |
| Open  |             |
| PartiallyRestricted   |             |
| Restricted  |             |
| <b>AccessURL</b>  | Container   |
| Attributes of the method for accessing a resource including a URL, name and description.  |             |
| Sub-elements:   |             |
| Description   |             |
| Language  |             |
| Name  |             |
| ProductKey  |             |
| URL   |             |
| <b>Acknowledgement</b>  | Text        |
| The individual, group or organization which should be acknowledged when the data is used in or contributes to a presentation or publication.                        |             |
| <b>Active</b>   | Item        |
| Exerting an influence or producing a change or effect. An active measurement is one which produces a transmission or excitation as a part of the measurement cycle. |             |
| <b>ActiveRegion</b>   | Item        |
| A localized, transient volume of the solar atmosphere in which PLAGEs, SUNSPOTS, FACULAE, FLAREs, etc. may be observed.   |             |
| <b>ActivityIndex</b>  | 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.

|   |                    |
|---|--------------------|
| <b>Address</b>  | <b>Text</b>        |
| Directions for finding some location; written on letters or packages that are to be delivered to that location.   |                    |
| <b>Aerosol</b>  | <b>Item</b>        |
| A suspension of fine solid or liquid particles in a gas.  |                    |
| <b>AkasofuEpsilon</b>   | <b>Item</b>        |
| A measure of the magnetopause energy flux and an indicator of the solar wind power available for subsequent magnetospheric energization. Defined as: $V \cdot B^2 \cdot I^2 \cdot \sin(\theta/2)^4$ where B is the IMF, I is an empirical scaling parameter equal to 7 RE, and $\theta = \tan(BY / BZ)^{-1}$ the IMF clock angle. |                    |
| <b>Albedo</b>   | <b>Item</b>        |
| The ratio of reflected radiation from the surface to incident radiation upon it.  |                    |
| <b>AlfvenMachNumber</b>   | <b>Item</b>        |
| The ratio of the bulk flow speed to the Alfven speed.   |                    |
| <b>AlfvenVelocity</b>   | <b>Item</b>        |
| Phase velocity of the Alfven wave; In SI units it is the velocity of the magnetic field divided by the square root of the mass density times the permeability of free space ( $\mu$ ).  |                    |
| <b>AlphaParticle</b>  | <b>Item</b>        |
| A positively charged nuclear particle that consists of two protons and two neutrons.  |                    |
| <b>AlternateName</b>  | <b>Text</b>        |
| An alternative or shortened name used to refer to a resource. This includes acronyms, expanded names or a synonym for a resource.   |                    |
| <b>Ancillary</b>  | <b>Item</b>        |
| A complementary item which can be subordinate, subsidiary, auxiliary, supplementary to the primary item.  |                    |
| <b>Anisotropy</b>   | <b>Item</b>        |
| Direction-dependent property.   |                    |
| <b>Annotation</b>   | <b>Container</b>   |
| Information which is explanatory or descriptive which is associated with another resource.<br>Sub-elements:   |                    |
| <ul style="list-style-type: none"> <li>AnnotationType</li> <li>ClassificationMethod</li> <li>ConfidenceRating</li> <li>Extension</li> <li>ImageURL</li> <li>ObservationExtent</li> <li>PhenomenonType</li> <li>ResourceHeader</li> <li>ResourceID</li> <li>TimeSpan</li> </ul>  |                    |
| <b>AnnotationType</b>   | <b>Enumeration</b> |
| A classification for an annotation.<br>Allowed Values:  |                    |
| <ul style="list-style-type: none"> <li>Anomaly</li> <li>Event</li> <li>Feature</li> </ul>   |                    |



|   |             |
|---|-------------|
| <b>Anomaly</b>  | Item        |
| An interval where measurements or observations may be adversely affected.   |             |
| <b>Antenna</b>  | Item        |
| A sensor used to measure electric potential.  |             |
| <b>ArchiveSpecialist</b>  | Item        |
| An individual who is an expert on a collection of resources and may also be knowledgeable of the phenomenon and related physics represented by the resources. This includes librarians, curators, archive scientists and other experts. |             |
| <b>Area</b>   | Item        |
| Integration over the extent of a planar region, or of the surface of a solid.   |             |
| <b>Ariel</b>  | Item        |
| The fourth-largest moon of Uranus.  |             |
| <b>Array</b>  | Item        |
| A sequence of values corresponding to the elements in a rectilinear, n-dimension matrix. Each value can be referenced by a unique index.  |             |
| <b>ArrivalDirection</b>   | Item        |
| An angular measure of the direction from which an energetic particle or photon was incident on a detector. The angles may be measured in any coordinate system.   |             |
| <b>Association</b>  | Container   |
| Attributes of a relationship a resource has with another resource.<br>Sub-elements:<br>AssociationID<br>AssociationType<br>Note   |             |
| <b>AssociationID</b>  | Text        |
| The resource identifier for a resource with which this resource is closely associated.  |             |
| <b>AssociationType</b>  | Enumeration |
| A characterization of the role or purpose of an associated resource.<br>Allowed Values:<br>ChildEventOf<br>DerivedFrom<br>ObservedBy<br>Other<br>PartOf<br>RevisionOf   |             |
| <b>Asteroid</b>   | Item        |
| A small extraterrestrial body consisting mostly of rock and metal that is in orbit around the sun.  |             |
| <b>Atmosphere</b>   | Item        |
| The neutral gases surrounding a body that extends from the surface and is bound to the body by virtue of the gravitational attraction.  |             |
| <b>Atom</b>   | Item        |
| Matter consisting of a nucleus surrounded by electrons which has no net charge.   |             |
| <b>AtomicNumber</b>   | Numeric     |
| The number of protons in the nucleus of an atom.  |             |
| <b>AtomicNumberDetected</b>   | Item        |
| The number of protons in the nucleus of an atom as determined by a detector.  |             |

|  |             |
|--|-------------|
| <b>Aurora</b>  | Item        |
| An atmospheric phenomenon consisting of bands of light caused by charged solar particles following the earth's magnetic lines of force.  |             |
| <b>AuroralRegion</b>   | 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 optical phenomenon.  |             |
| <b>Automatic</b>   | Item        |
| Determined by the analysis or assessment performed by a program or server.   |             |
| <b>Availability</b>  | Enumeration |
| An indication of the method or service which may be used to access the resource.<br>Allowed Values:<br>Offline<br>Online   |             |
| <b>Average</b>   | Item        |
| The statistical mean; the sum of a set of values divided by the number of values in the set.   |             |
| <b>AverageChargeState</b>  | Item        |
| A measure of the composite deficit (positive) or excess (negative) of electrons with respect to protons.   |             |
| <b>AxisLabel</b>   | Text        |
| A short character string (approximately 10 characters, but preferably 6 characters - more only if absolutely required for clarity) which can be used to label a y-axis for a plot or to provide a heading for a data listing.  |             |
| <b>AzimuthAngle</b>  | Item        |
| The angle between the projection into the i-j plane of a position or measured vector and the i-axis of the coordinate system. Mathematically defined as $\arctan(j/i)$ . This term could be also applied to angles measured in different planes, for example the IMF clock angle defined as $\arctan( B_y /B_z)$ .   |             |
| <b>AzimuthalAngleRange</b>   | Container   |
| The range of possible azimuthal angles for a group of energy observations. Default units are degrees.<br>Sub-elements:<br>Bin<br>High<br>Low<br>Units  |             |
| <b>BZIP2</b>   | Item        |
| An open standard algorithm by Julian Seward using Burrows-Wheeler block sorting and Huffman coding. See <a href="http://www.bzip.org/">http://www.bzip.org/</a>  |             |
| <b>BandName</b>  | Text        |
| A common or provider assigned name for a range of values.  |             |
| <b>Bandwidth</b>   | Item        |
| Integration over the width a frequency band.   |             |
| <b>Base64</b>  | 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. |             |

|  |                  |
|--|------------------|
| <b>Bin</b>   | <b>Container</b> |
| A grouping of observations according to a band or window of a common attribute.<br>Sub-elements:<br>BandName<br>High<br>Low  |                  |
| <b>Binary</b>  | <b>Item</b>      |
| A direct representation of the bits which may be stored in memory on a computer.   |                  |
| <b>BowShockCrossing</b>  | <b>Item</b>      |
| A crossing of the boundary between the undisturbed (except for foreshock effects) solar wind and the shocked, decelerated solar wind of the magnetosheath.   |                  |
| <b>Browse</b>  | <b>Item</b>      |
| A representation of an image which is suitable to reveal most or all of the details of the image.  |                  |
| <b>CDF</b>   | <b>Item</b>      |
| Common Data Format (CDF). A binary storage format developed at Goddard Space Flight Center (GSFC).   |                  |
| <b>CEF</b>   | <b>Item</b>      |
| 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.  |                  |
| <b>CEF1</b>  | <b>Item</b>      |
| 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.  |                  |
| <b>CEF2</b>  | <b>Item</b>      |
| 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.   |                  |
| <b>CGM</b>   | <b>Item</b>      |
| 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 < <a href="http://nssdc.gsfc.nasa.gov/space/cgm/cgmm_des.html">http://nssdc.gsfc.nasa.gov/space/cgm/cgmm_des.html</a> > |                  |
| <b>CSO</b>   | <b>Item</b>      |
| Corrected Solar Orbital - A coordinate system related to Earth where X is anti-sunward, Y along the orbital velocity direction.  |                  |
| <b>CSV</b>   | <b>Item</b>      |
| Comma Separated Value - A data exchange format defined by RFC 4180.  |                  |
| <b>CaK</b>   | <b>Item</b>      |
| 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.   |                  |
| <b>Cadence</b>   | <b>Duration</b>  |
| The nominal or most common time interval between the start of successive measurements.   |                  |
| <b>CadenceMax</b>  | <b>Duration</b>  |
| The largest time interval between the start of successive measurements.  |                  |

|   |                  |
|---|------------------|
| <b>CadenceMin</b>   | <b>Duration</b>  |
| The smallest time interval between the start of successive measurements.  |                  |
| <b>Calibrated</b>   | <b>Item</b>      |
| Data wherein sensor outputs have been convolved with instrument response function, often irreversibly, to yield data in physical units.   |                  |
| <b>Callisto</b>   | <b>Item</b>      |
| A second largest moon of Jupiter and the third-largest moon in the solar system.  |                  |
| <b>Carrington</b>   | <b>Item</b>      |
| A coordinate system which is centered at the Sun and is "fixed" with respect 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.  |                  |
| <b>Cartesian</b>  | <b>Item</b>      |
| A representation in which a position vector or a measured vector (e.g., field or flow) is specified by its components along the base axes of the coordinate system.   |                  |
| <b>Catalog</b>  | <b>Container</b> |
| A tabular listing of events or observational notes, especially those that have utility in aiding a user in locating data. Catalogs include lists of events, files in a product, and data availability. A Catalog resource is a type of "data product" which is a set of data that is uniformly processed and formatted, from one or more instruments, typically spanning the full duration of the observations of the relevant instrument(s). A data product may consist of a collection of granules of successive time spans, but may be a single high-level entity. |                  |
| Sub-elements:   |                  |
| <ul style="list-style-type: none"> <li>AccessInformation</li> <li>Caveats</li> <li>Extension</li> <li>InputResourceID</li> <li>InstrumentID</li> <li>Keyword</li> <li>Parameter</li> <li>PhenomenonType</li> <li>ProviderName</li> <li>ProviderResourceName</li> <li>ProviderVersion</li> <li>ResourceHeader</li> <li>ResourceID</li> <li>TimeSpan</li> </ul>   |                  |
| <b>Caveats</b>  | <b>Text</b>      |
| Information which may be important in the avoidance of the misuse of the resource, for instance instrument maladies, corruption or contamination.   |                  |
| <b>Channeltron</b>  | <b>Item</b>      |
| 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.   |                  |
| <b>Characteristic</b>   | <b>Item</b>      |
| A quantity which can be easily identified and measured in a given environment.  |                  |
| <b>ChargeState</b>  | <b>Item</b>      |
| Charge of a fully or partially stripped ion, in units of the charge of a proton. Charge state of a bare proton = 1.   |                  |
| <b>Checksum</b>   | <b>Container</b> |
| 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:

HashFunction

HashValue

**ChildEventOf** Item

A descendant or caused by another resource.

**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.

**ClassificationMethod** Enumeration

The technique used to determine the characteristics of an object.

Allowed Values:

Automatic

Inferred

Inspection

**CoInvestigator** Item

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

**ColorBar** Item

A spectrum or set of colors used to represent data values.

**Column** Item

A two-dimensional measure of a quantity. The column is the area over which the quantity is measured.

**Comet** Item

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

**Component** Enumeration

Projection of a vector along one of the base axes of a coordinate system.

Allowed Values:

I

J

K

**Confidence** Item

An expression of how certain that a quantity is valid or accurate.

**ConfidenceRating** Enumeration

A classification of the certainty of an assertion.

**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:

PersonID

## Role

|  |                    |
|--|--------------------|
| <b>Contributor</b>   | <b>Item</b>        |
| An entity responsible for making contributions to the content of the resource.                       |                    |
| <b>CoordinateRepresentation</b>  | <b>Enumeration</b> |
| The method or form for specifying a given point or vector in a given coordinate system.              |                    |
| Allowed Values:  |                    |
| Cartesian  |                    |
| Cylindrical  |                    |
| Spherical  |                    |
| <b>CoordinateSystem</b>  | <b>Container</b>   |
| The specification of the orientation of a set of (typically) orthogonal base axes.                   |                    |
| Sub-elements:  |                    |
| CoordinateRepresentation   |                    |
| CoordinateSystemName   |                    |
| <b>CoordinateSystemName</b>  | <b>Enumeration</b> |
| Identifies the coordinate system in which the position, direction or observation has been expressed. |                    |
| Allowed Values:  |                    |
| CGM  |                    |
| CSO  |                    |
| Carrington   |                    |
| DM   |                    |
| ECEF   |                    |
| ENP  |                    |
| GEI  |                    |
| GEO  |                    |
| GPHIO  |                    |
| GSE  |                    |
| GSEQ   |                    |
| GSM  |                    |
| HAE  |                    |
| HCC  |                    |
| HCI  |                    |
| HCR  |                    |
| HEE  |                    |
| HEEQ   |                    |
| HERTN  |                    |
| HG   |                    |
| HGI  |                    |
| HGRTN  |                    |
| HPC  |                    |
| HPR  |                    |
| HSM  |                    |
| J2000  |                    |
| JSM  |                    |
| JSO  |                    |
| KSM  |                    |
| KSO  |                    |
| LGM  |                    |
| MAG  |                    |
| MFA  |                    |
| MSO  |                    |
| RTN  |                    |
| SC   |                    |
| SE   |                    |
| SM   |                    |
| SR   |                    |
| SR2  |                    |
| SSE  |                    |

SSE\_L  
 SpacecraftOrbitPlane  
 TIS  
 VSO  
 WGS84

|  |             |
|--|-------------|
| <b>Core</b>  | <b>Item</b> |
| The central or main part of an object or calculated distribution. For example, the part of a distribution of particles at low energies that is a thermal (Maxwellian) population.  |             |
| <b>Corona</b>  | <b>Item</b> |
| 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.   |             |
| <b>CoronalHole</b>   | <b>Item</b> |
| 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. |             |
| <b>CoronalMassEjection</b>   | <b>Item</b> |
| A solar event (CME) that involves a burst of plasma ejected into the interplanetary medium. CME's may be observed remotely relatively near the sun or in situ in the interplanetary medium. The latter type of observations are often referred to as Interplanetary CME's (ICME's).  |             |
| <b>Coronagraph</b>   | <b>Item</b> |
| 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 celestial objects.   |             |
| <b>CountRate</b>   | <b>Item</b> |
| The number of events per unit time.  |             |
| <b>Counts</b>  | <b>Item</b> |
| The number of detection events occurring in a detector over the detector accumulation time.  |             |
| <b>CrossSpectrum</b>   | <b>Item</b> |
| The Fourier transform of the cross correlation of two physical or empirical observations.  |             |
| <b>Current</b>   | <b>Item</b> |
| The flow of electrons through a conductor caused by a potential difference.  |             |
| <b>Cylindrical</b>   | <b>Item</b> |
| A coordinate representation of a position vector or measured vector (field or flow) by its k-component, the magnitude of its projection into the i-j plane, and the azimuthal angle of the i-j plane projection.   |             |
| <b>DM</b>  | <b>Item</b> |
| 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 < <a href="http://cdpp.cnes.fr/00428.pdf">http://cdpp.cnes.fr/00428.pdf</a> >   |             |
| <b>DRegion</b>   | <b>Item</b> |
| 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.   |             |
| <b>Data</b>  | <b>Item</b> |
| A collection of organized information, usually the results of experience, observation or   |             |

experiment, or a set of premises. This may consist of numbers, words, or images, particularly as measurements or observations of a set of variables.

|   |                    |
|---|--------------------|
| <b>DataExtent</b>   | <b>Container</b>   |
| The area of storage in a file system required to store the contents of a resource. The default units for data extent is bytes.  |                    |
| Sub-elements:   |                    |
| Per<br>Quantity<br>Units  |                    |
| <b>DataProducer</b>   | <b>Item</b>        |
| An individual who generated the resource and is familiar with its provenance.   |                    |
| <b>Deimos</b>   | <b>Item</b>        |
| The smaller and outer most moon of Mars.  |                    |
| <b>DeputyPI</b>   | <b>Item</b>        |
| An individual who is an administrative or scientific leader for an investigation operating under the supervision of a Principal Investigator.   |                    |
| <b>DerivedFrom</b>  | <b>Item</b>        |
| A transformed or altered version of a resource instance.  |                    |
| <b>Description</b>  | <b>Text</b>        |
| A narrative explanation with detail appropriate for the item it describes. For example a description of data resource 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 the resource. |                    |
| <b>Deviation</b>  | <b>Item</b>        |
| The difference between an observed value and the expected value of a quantity.  |                    |
| <b>Differential</b>   | <b>Item</b>        |
| A measurement within a narrow range of energy and/or solid angle.   |                    |
| <b>Dione</b>  | <b>Item</b>        |
| The forth-largest moon of Saturn.   |                    |
| <b>Direction</b>  | <b>Item</b>        |
| The spatial relation between an object and another object, the orientation of the object or the course along which the object points or moves.  |                    |
| <b>DirectionAngle</b>   | <b>Enumeration</b> |
| The angle between a position vector or measured vector (or one of its projections onto a plane) and one of the base axes of the coordinate system.  |                    |
| Allowed Values:   |                    |
| AzimuthAngle<br>ElevationAngle<br>PolarAngle  |                    |
| <b>Directional</b>  | <b>Item</b>        |
| A measurement within a narrow range of solid angle.   |                    |
| <b>DisplayCadence</b>   | <b>Duration</b>    |
| The time interval between the successive display elements.  |                    |
| <b>DisplayData</b>  | <b>Container</b>   |
| A graphical representation of data wherein the underlying numeric values are not (readily) accessible for analysis.. Examples are line plots and spectrograms. A Display Data resource is a   |                    |



type of "data product" which is a set of data that is uniformly processed and formatted, from one or more instruments, typically spanning the full duration of the observations of the relevant instrument(s). A data product may consist of a collection of granules of successive time spans, but may be a single high-level entity.

Sub-elements:

- AccessInformation
- Caveats
- DisplayCadence
- Extension
- InputResourceID
- InstrumentID
- Keyword
- MeasurementType
- ObservedRegion
- Parameter
- ProcessingLevel
- ProviderName
- ProviderProcessingLevel
- ProviderResourceName
- ProviderVersion
- ResourceHeader
- ResourceID
- SpectralRange
- TemporalDescription

|                    |                    |
|--------------------|--------------------|
| <b>DisplayType</b> | <b>Enumeration</b> |
|--------------------|--------------------|

The general styling or type of plot that is suitable for the variable.

Allowed Values:

- Image
- Plasmagram
- Spectrogram
- StackPlot
- TimeSeries
- WaveForm

|                 |                  |
|-----------------|------------------|
| <b>Document</b> | <b>Container</b> |
|-----------------|------------------|

A set of information designed and presented as an individual entity. A document may contain plain or formatted text, in-line graphics, sound, other multimedia data, or hypermedia references. A Document resource is intended for use on digital objects that have no other identifier (e.g., DOI or ISBN).

Sub-elements:

- AccessInformation
- DocumentType
- InputResourceID
- Keyword
- MIMEType
- ResourceHeader
- ResourceID

|                     |                    |
|---------------------|--------------------|
| <b>DocumentType</b> | <b>Enumeration</b> |
|---------------------|--------------------|

A characterization of the content, purpose, or style of the document.

Allowed Values:

- Other
- Poster
- Presentation
- Report
- Specification
- TechnicalNote
- WhitePaper

|                         |             |
|-------------------------|-------------|
| <b>DopplerFrequency</b> | <b>Item</b> |
|-------------------------|-------------|

Change in the frequency of a propagating wave due to motion of the source, the observer, the reflector, or the propagation medium.

|  |                    |
|--|--------------------|
| <b>Dopplergram</b>   | <b>Item</b>        |
| A map or image depicting the spatial distribution of line-of-sight velocities of the observed object.  |                    |
| <b>DoubleSphere</b>  | <b>Item</b>        |
| 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.  |                    |
| <b>Dust</b>  | <b>Item</b>        |
| Free microscopic particles of solid material.  |                    |
| <b>DustDetector</b>  | <b>Item</b>        |
| An instrument which determines the mass and speed of ambient dust particles.   |                    |
| <b>ECEF</b>  | <b>Item</b>        |
| The Earth-Centered, Earth-Fixed (ECEF) coordinate system has point (0,0,0) defined as the center of mass of the Earth. Its axes are aligned with the International Reference Pole (IRP) and International Reference Meridian (IRM). The x-axis intersects the sphere of the Earth at 0 degree latitude (Equator) and 0 degree longitude (Greenwich). The z-axis points north. The y-axis completes the right handed coordinate system. |                    |
| <b>EITWave</b>   | <b>Item</b>        |
| 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.  |                    |
| <b>ENP</b>   | <b>Item</b>        |
| ENP (also called PEN) - The P vector component points northward, perpendicular to orbit plane which for a zero degree inclination orbit is parallel to Earth's spin axis. The E vector component is perpendicular to P and N and points earthward. The N component is perpendicular to P and E and is positive eastward.   |                    |
| <b>ERegion</b>   | <b>Item</b>        |
| 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.  |                    |
| <b>Earth</b>   | <b>Enumeration</b> |
| The third planet from the sun in our solar system.<br>Allowed Values:  |                    |
| Magnetosheath  |                    |
| Magnetosphere  |                    |
| Magnetosphere.Magnetotail  |                    |
| Magnetosphere.Main   |                    |
| Magnetosphere.Polar  |                    |
| Magnetosphere.RadiationBelt  |                    |
| Moon   |                    |
| NearSurface  |                    |
| NearSurface.Atmosphere   |                    |
| NearSurface.AuroralRegion  |                    |
| NearSurface.EquatorialRegion   |                    |
| NearSurface.Ionosphere   |                    |
| NearSurface.Ionosphere.DRegion   |                    |
| NearSurface.Ionosphere.ERegion   |                    |
| NearSurface.Ionosphere.FRegion   |                    |
| NearSurface.Ionosphere.Topside   |                    |
| NearSurface.Mesosphere   |                    |
| NearSurface.Plasmasphere   |                    |
| NearSurface.PolarCap   |                    |
| NearSurface.SouthAtlanticAnomalyRegion   |                    |
| NearSurface.Stratosphere   |                    |

NearSurface.Thermosphere  
 NearSurface.Troposphere  
 Surface

|  |                  |
|--|------------------|
| <b>Electric</b>  | <b>Item</b>      |
| The physical attribute that exerts an electrical force.  |                  |
| <b>ElectricField</b>   | <b>Item</b>      |
| A region of space around a charged particle, or between two voltages within which a force is exerted on charged objects in its vicinity. An electric field is the electric force per unit charge.  |                  |
| <b>Electromagnetic</b>   | <b>Item</b>      |
| Electric and magnetic field variations in time and space that propagate through a medium or a vacuum with the wave's propagation, electric field, and magnetic field vectors forming an orthogonal triad. Waves in this category are detected by having their field quantities measured. |                  |
| <b>Electron</b>  | <b>Item</b>      |
| An elementary particle consisting of a charge of negative electricity equal to about $1.602 \times 10^{-19}$ Coulomb and having a mass when at rest of about $9.109534 \times 10^{-28}$ gram.  |                  |
| <b>ElectronDriftInstrument</b>   | <b>Item</b>      |
| 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.  |                  |
| <b>Electrostatic</b>   | <b>Item</b>      |
| Collective longitudinal electric-field and plasma oscillations trapped within a body of plasma.  |                  |
| <b>ElectrostaticAnalyser</b>   | <b>Item</b>      |
| An instrument which uses charged plates to analyze the mass, charge and kinetic energies of charged particles which enter the instrument.  |                  |
| <b>Element</b>   | <b>Container</b> |
| A component or individual unit of a multiple value quantity such as an array or vector.<br>Sub-elements:<br>FillValue<br>Index<br>Name<br>ParameterKey<br>Qualifier<br>RenderingHints<br>Units<br>UnitsConversion<br>ValidMax<br>ValidMin  |                  |
| <b>Elevation</b>   | <b>Numeric</b>   |
| The distance in meters above (positive) or below (negative) the "zero elevation" defined by the World Geodetic System reference frame (WGS84).   |                  |
| <b>ElevationAngle</b>  | <b>Item</b>      |
| The angle between the position or measured vector and the i-j plane of the coordinate system. Mathematically defined as $\arctan(k/\sqrt{i^2+j^2})$ .  |                  |
| <b>Email</b>   | <b>Text</b>      |
| The electronic address at which the individual may be contacted expressed in the form "local-part@domain".   |                  |
| <b>Emissivity</b>  | <b>Item</b>      |
| The energy emitted spontaneously per unit bandwidth (typically frequency) per unit time per unit mass of source. Emissivity is usually integrated over all directions/solid angles.  |                  |

|  |                    |
|--|--------------------|
| <b>Enceladus</b>   | <b>Item</b>        |
| The sixth-largest moon of Saturn. It is currently endogenously active. The smallest known body in the Solar System that is geologically active today.  |                    |
| <b>Encoding</b>  | <b>Enumeration</b> |
| A set of unambiguous rules that establishes the representation of information within a file.   |                    |
| Allowed Values:  |                    |
| ASCII  |                    |
| BZIP2  |                    |
| Base64   |                    |
| GZIP   |                    |
| None   |                    |
| S3_BUCKET  |                    |
| TAR  |                    |
| Unicode  |                    |
| ZIP  |                    |
| <b>EnergeticParticleInstrument</b>   | <b>Item</b>        |
| An instrument that measures fluxes of charged particles as a function of time, direction of motion, mass, charge and/or species.   |                    |
| <b>EnergeticParticles</b>  | <b>Item</b>        |
| Pieces of matter that are moving very fast. Energetic particles include protons, electrons, neutrons, neutrinos, the nuclei of atoms, and other sub-atomic particles.  |                    |
| <b>EnergeticSolarParticleEvent</b>   | <b>Item</b>        |
| An enhancement of interplanetary fluxes of energetic ions accelerated by interplanetary shocks and/or solar flares.  |                    |
| <b>Energy</b>  | <b>Item</b>        |
| 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)   |                    |
| <b>EnergyDensity</b>   | <b>Item</b>        |
| The amount of energy per unit volume.  |                    |
| <b>EnergyFlux</b>  | <b>Item</b>        |
| The amount of energy passing through a unit area in a unit time.   |                    |
| <b>EnergyRange</b>   | <b>Container</b>   |
| The minimum and maximum energy values of the particles represented by a given "physical parameter" description.  |                    |
| Sub-elements:  |                    |
| Bin  |                    |
| High   |                    |
| Low  |                    |
| Units  |                    |
| <b>Entropy</b>   | <b>Item</b>        |
| A function of thermodynamic quantity, such as temperature, pressure, or composition, that is a measure of the energy that is not available for work during a thermodynamic process. It is often interpreted as the degree of disorder or randomness in the system. |                    |
| <b>Ephemeris</b>   | <b>Item</b>        |
| 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.  |                    |
| <b>EquatorialRegion</b>  | <b>Item</b>        |
| A region centered on the equator and limited in latitude by approximately 23 degrees north and south of the equator.   |                    |

|   |                 |
|---|-----------------|
| <b>EquivalentWidth</b>  | <b>Item</b>     |
| The spectral width of a total absorption line having the amount of absorbed radiant energy being equivalent to that in an observed absorption line.   |                 |
| <b>Europa</b>   | <b>Item</b>     |
| The sixth-closest round moon of Jupiter.  |                 |
| <b>Event</b>  | <b>Item</b>     |
| An action or observation which occurs at a point in time.   |                 |
| <b>Excel</b>  | <b>Item</b>     |
| A Microsoft spreadsheet format used to hold a variety of data in tables which can include calculations.   |                 |
| <b>ExpirationDate</b>   | <b>DateTime</b> |
| 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.  |                 |
| <b>Exposure</b>   | <b>Duration</b> |
| The time interval over which an individual measurement is taken.  |                 |
| <b>ExposureMax</b>  | <b>Duration</b> |
| The largest interval over which an individual measurement is taken.   |                 |
| <b>ExposureMin</b>  | <b>Duration</b> |
| The smallest time interval over which an individual measurement is taken.   |                 |
| <b>Extension</b>  | <b>Text</b>     |
| 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 specifications.  |                 |
| <b>ExtremeUltraviolet</b>   | <b>Item</b>     |
| 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  |                 |
| <b>FITS</b>   | <b>Item</b>     |
| 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.  |                 |
| <b>FRegion</b>  | <b>Item</b>     |
| 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. |                 |
| <b>FarUltraviolet</b>   | <b>Item</b>     |
| A spectrum with a wavelength range of 122 nm to 200.0nm. VSO nickname: FUV image with a range of 122.0 nm to 200 nm   |                 |
| <b>FaradayCup</b>   | <b>Item</b>     |
| 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.  |                 |
| <b>FaxNumber</b>  | <b>Text</b>     |

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.

**Feature** **Item**

A prominent or distinctive characteristic that occurs at a location or persists over a period of time.

**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:

FieldQuantity  
FrequencyRange  
Qualifier

**FieldAligned** **Item**

The component of a quantity which is oriented in the same direction of a field.

**FieldQuantity** **Enumeration**

The physical attribute of the field.

Allowed Values:

Current  
Electric  
Electromagnetic  
Gyrofrequency  
Magnetic  
PlasmaFrequency  
Potential  
PoyntingFlux

**FillValue** **Text**

A value that indicates that a quantity is undefined.

**Film** **Item**

An image recording medium on which usually a "negative" analog image is registered. A "positive" image can be recovered or reproduced from film, which is usually made of flexible materials for ease of storage and transportation.

**Fit** **Item**

Values that make an model agree with the data.

**FlowSpeed** **Item**

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

**FlowVelocity** **Item**

The volume of matter passing through a unit area perpendicular to the direction of flow in a unit of time.

**Fluence** **Item**

The time integral of a flux. A fluence does not have any "per unit time" in its units.

**FluxFeedback** **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.

**ForbushDecrease** **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.<br>Allowed Values: | AVI<br>Binary<br>CDF<br>CEF<br>CEF1<br>CEF2<br>CSV<br>Excel<br>FITS<br>GIF<br>HDF<br>HDF4<br>HDF5<br>HTML<br>Hardcopy<br>Hardcopy.Film<br>Hardcopy.Microfiche<br>Hardcopy.Microfilm<br>Hardcopy.Photograph<br>Hardcopy.PhotographicPlate<br>Hardcopy.Print<br>IDFS<br>IDL<br>JPEG<br>JSON<br>MATLAB_4<br>MATLAB_6<br>MATLAB_7<br>MPEG<br>NCAR<br>NetCDF<br>PDF<br>PNG<br>Postscript<br>QuickTime<br>TIFF<br>Text<br>Text.ASCII<br>Text.Unicode<br>UDF<br>VOTable<br>XML |

| FormerPI  | Item      |
|---|-----------|
| An individual who had served as the administrative and scientific lead for an investigation, but no longer assumes that role. |           |
| FourierTransformSpectrograph  | Item      |
| An instrument that determines the spectra of a radiative source, using time-domain measurements and a Fourier transform.      |           |
| Frequency   | Item      |
| The number of occurrences of a repeating event per unit time.   |           |
| FrequencyRange  | Container |
| The range of possible values for the observed frequency.<br>Sub-elements:   | Bin       |

High  
Low  
SpectralRange  
Units

|   |      |
|---|------|
| FrequencyToGyrofrequencyRatio   | Item |
| The ratio of the characteristic frequency of a medium to gyrofrequency of a particle.   |      |
| GEI   | Item |
| 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. When the X axis is the direction of the mean vernal equinox of J2000, the coordinate system is also called GCI. Then the Z axis is also defined as being normal to the mean Earth equator of J2000. |      |
| 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.  |      |
| GPHIO   | Item |
| Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.  |      |
| 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 < <a href="http://www.gnu.org/software/gzip/gzip.html">http://www.gnu.org/software/gzip/gzip.html</a> > or < <a href="http://www.gzip.org/">http://www.gzip.org/</a> >  |      |
| GammaRays   | Item |
| Photons with a wavelength range: 0.00001 to 0.001 nm  |      |
| Ganymede  | Item |
| The biggest moon of Jupiter and in the solar system.  |      |
| GeigerMuellerTube   | Item |
| An instrument which measures density of ionizing radiation based on interactions with a gas.  |      |
| GeneralContact  | Item |
| An individual who can provide information on a range of subjects or who can direct you to a domain expert.  |      |
| GeomagneticStorm  | 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.

|   |                  |
|---|------------------|
| <b>Granule</b>  | <b>Container</b> |
| An accessible portion of another resource. A Granule may be composed of one or more physical pieces (files) which are considered inseparable. For example, a data storage format that maintains metadata and binary data in separate, 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:   |                  |
| ExpirationDate  |                  |
| ParentID  |                  |
| PriorID   |                  |
| ReleaseDate   |                  |
| ResourceID  |                  |
| Source  |                  |
| StartDate   |                  |
| StopDate  |                  |
| <b>Group</b>  | <b>Item</b>      |
| An assemblage of values that a certain relation or common characteristic.   |                  |
| <b>Gyrofrequency</b>  | <b>Item</b>      |
| The number of gyrations around a magnetic guiding center (field line) a charged particle makes per unit time due to the Lorentz force.  |                  |
| <b>HAE</b>  | <b>Item</b>      |
| 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.   |                  |
| <b>HCC</b>  | <b>Item</b>      |
| Heliocentric Cartesian - A 3-D orthonormal coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points toward the observer. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Standard representation for this system is via the point's x and y values, expressed either as physical distances or as fractions of the solar disk radius.   |                  |
| <b>HCI</b>  | <b>Item</b>      |
| Heliographic Carrington Inertial.   |                  |
| <b>HCR</b>  | <b>Item</b>      |
| Heliocentric Radial - A 3-D orthonormal coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points toward the observer. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Standard representation for this system is via the point's distance rho from the Z axis [ $Rho = \sqrt{x^2 + y^2}$ ] and its phase angle psi measured counterclockwise from the +Y axis [ $psi = \arctan(-y/x)$ ]  |                  |
| <b>HDF</b>  | <b>Item</b>      |
| Hierarchical Data Format  |                  |
| <b>HDF4</b>   | <b>Item</b>      |
| Hierarchical Data Format, Version 4   |                  |
| <b>HDF5</b>   | <b>Item</b>      |

## Hierarchical Data Format, Version 5

|  |      |
|--|------|
| <b>HEE</b>   | 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   |      |
| <b>HEEQ</b>  | 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.   |      |
| <b>HERTN</b>   | Item |
| Helio-Ecliptic Radial Tangential Normal coordinate system. Typically centered at a spacecraft. The X axis (radial) is set as the primary axis, and is defined as the axis pointing from the spacecraft to the Sun. The Z axis (tangential) is set as the secondary axis, and is defined as that portion of the ecliptic rotational axis which is perpendicular to the primary axis. The Y axis (Normal) is defined as Z cross X.   |      |
| <b>HG</b>  | 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 < <a href="http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html">http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html</a> >  |      |
| <b>HGI</b>   | 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 < <a href="http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html">http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html</a> >   |      |
| <b>HGRTN</b>   | Item |
| Heliocentric Radial Tangential Normal coordinate system (aka RTN). Typically centered at a spacecraft. Used for IMF and plasma V vectors. The X axis (radial) is set as the primary axis, and is defined as the axis pointing from the spacecraft to the Sun. The Z axis (tangential) is set as the secondary axis, and is defined as that portion of the solar North rotational axis which is perpendicular to the primary axis. The Y axis (normal) is defined as Z cross X.   |      |
| <b>HPC</b>   | Item |
| Helioprojective Cartesian = A 3-D orthonormal (left-handed) coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points from the observer to the center of the solar disk. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Given as the distance between the observer and the center of the solar disk, the standard representation of an (x,y) point on the solar disk is via the point's longitude angle [ $\arctan(x/d)$ ] and latitude angle [ $\arctan(y/d)$ ].   |      |
| <b>HPR</b>   | Item |
| Helioprojective Radial - A 3-D orthonormal (left-handed) coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points from the observer to the center of the solar disk. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Given as the distance between the observer and the center of the solar disk, the standard representation for this system of an (x,y) point on the solar disk is via the point's latitude angle $\theta$ [ $= \arctan[\text{SQRT}(x^2 + y^2)/d]$ ] or equivalent declination parameter $\delta$ ( $= \theta - 90$ deg), and its phase angle $\psi$ as measured counter-clockwise from the +Y axis [ $\psi = \arctan(-y/x)$ ]. |      |
| <b>HSM</b>   | Item |
| Heliospheric 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.   |      |

|   |                    |
|---|--------------------|
| <b>HTML</b>   | <b>Item</b>        |
| A text file containing structured information represented in the HyperText Mark-up Language (HTML). See < <a href="http://www.w3.org/MarkUp/">http://www.w3.org/MarkUp/</a> >   |                    |
| <b>Halo</b>   | <b>Item</b>        |
| The part of an object or distribution surrounding some central body or distribution. For example, the particles above the core energies that show enhancements above the thermal population. Typically, a "power law tail" shows a break from the core Maxwellian at a particular energy. |                    |
| <b>Halpha</b>   | <b>Item</b>        |
| 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.  |                    |
| <b>HardXrays</b>  | <b>Item</b>        |
| Photons with a wavelength range: 0.001 to 0.1 nm and an energy range of 12 keV to 120 keV   |                    |
| <b>Hardcopy</b>   | <b>Enumeration</b> |
| A permanent reproduction, or copy in the form of a physical object, of any media suitable for direct use by a person.<br>Allowed Values:<br>Film<br>Microfiche<br>Microfilm<br>Photograph<br>PhotographicPlate<br>Print   |                    |
| <b>HashFunction</b>   | <b>Enumeration</b> |
| 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.<br>Allowed Values:<br>MD5<br>SHA1<br>SHA256  |                    |
| <b>HashValue</b>  | <b>Text</b>        |
| The value calculated by a hash function, e.g. the message digest of a digital data object.  |                    |
| <b>He10830</b>  | <b>Item</b>        |
| 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.  |                    |
| <b>He304</b>  | <b>Item</b>        |
| A spectrum centered around the resonance line of ionised helium at 304 Angstrom (30.4 nm).  |                    |
| <b>HeatFlux</b>   | <b>Item</b>        |
| Flow of thermal energy through a gas or plasma; typically computed as third moment of a distribution function.  |                    |
| <b>Heliosheath</b>  | <b>Item</b>        |
| The region extending radially outward from the heliospheric termination shock and in which the decelerated solar wind plasma is still significant.  |                    |
| <b>Heliosphere</b>  | <b>Enumeration</b> |
| 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.<br>Allowed Values:<br>Heliosheath<br>Inner<br>NearEarth  |                    |

Outer  
Remote1AU

|  |          |
|--|----------|
| <b>High</b>  | Numeric  |
| The largest value within a range of possible values.   |          |
| <b>Horizontal</b>  | Item     |
| Parallel to or in the plane of the horizon or a base line.   |          |
| <b>Hydrodynamic</b>  | Item     |
| Periodic or quasi-periodic oscillations of fluid quantities.   |          |
| <b>I</b>   | Item     |
| Projection of a vector along the first named axis of a coordinate system. Typically the X axis, but could be the R axis for an RTN coordinate system.  |          |
| <b>IDFS</b>  | 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).              |          |
| <b>IDL</b>   | Item     |
| Interactive Data Language (IDL) save set. IDL is a proprietary format.   |          |
| <b>IJ</b>  | Item     |
| A measure of the length of a position or measured vector projected into the i-j (typically X-Y) plane of the coordinate system.  |          |
| <b>IK</b>  | Item     |
| A measure of the length of a position or measured vector projected into the i-k (typically X-Z) plane of the coordinate system.  |          |
| <b>IMFClockAngle</b>   | Item     |
| The clockwise angle of the direction of interplanetary magnetic field (IMF) measured in the plane of the body pole perpendicular to the line between the body and the Sun.                               |          |
| <b>Iapetus</b>   | Item     |
| The third-largest moon of Saturn and the eleventh-largest in the Solar System.   |          |
| <b>Image</b>   | Item     |
| A two-dimensional representation of data with values at each element of the array related to an intensity or a color.  |          |
| <b>ImageIntensity</b>  | 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. |          |
| <b>ImageURL</b>  | URL      |
| A URL to graphic, image or movie.  |          |
| <b>Imager</b>  | Item     |
| An instrument which samples the radiation from an area at one or more spectral ranges emitted or reflected by an object.   |          |
| <b>ImagingSpectrometer</b>   | Item     |
| An instrument which is a multispectral scanner with a very large number of channels (64-256 channels) with very narrow band widths.  |          |
| <b>Index</b>   | Sequence |
| The location of an item in an array or vector. An index can be multivalued to represent the  |          |

location in a multidimensional object. The index of the first item is "1". A value of "0" is a wild card for all elements at the location in an array. A value of "-1" is a reference to the dimension at the location in the array. A "-1" is used when describing the attributes of the dimension, where as "0" or a positive integer is used to describe attributes of individual elements.

**Inferred** **Item**

Determined by the analysis of other information or resources.

**InformationURL** **Container**

Attributes of the method of acquiring additional information.

Sub-elements:

Description  
Language  
Name  
URL

**Infrared** **Item**

Photons with a wavelength range: 760 to  $1.00 \times 10^6$  nm

**Inner** **Item**

The region of the heliosphere extending radially outward from the solar coronal base to just inside 1 AU.

**InputResourceID** **Text**

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

**Inspection** **Item**

Determined by the analysis or assessment performed by a person.

**Instrument** **Container**

A device that makes measurements used to characterize a physical phenomenon, or a family of like devices.

Sub-elements:

Caveats  
Extension  
InstrumentType  
InvestigationName  
ObservatoryID  
OperatingSpan  
ResourceHeader  
ResourceID

**InstrumentID** **Text**

The identifier of an Instrument resource.

**InstrumentMode** **Item**

An indication of a state (mode) in which the instrument is operating. How a mode influences the interpretation and representation of data is described in instrument related documentation.

**InstrumentStatus** **Item**

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

**InstrumentType** **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  
Coronagraph  
DoubleSphere  
DustDetector

ElectronDriftInstrument  
 ElectrostaticAnalyser  
 EnergeticParticleInstrument  
 FaradayCup  
 FluxFeedback  
 FourierTransformSpectrograph  
 Geiger-MuellerTube  
 Imager  
 ImagingSpectrometer  
 Interferometer  
 IonChamber  
 IonDrift  
 LangmuirProbe  
 LongWire  
 Magnetograph  
 Magnetometer  
 MassSpectrometer  
 MicrochannelPlate  
 MultispectralImager  
 NeutralAtomImager  
 NeutralParticleDetector  
 ParticleCorrelator  
 ParticleDetector  
 Photometer  
 PhotomultiplierTube  
 Photopolarimeter  
 Platform  
 ProportionalCounter  
 QuadrisphericalAnalyser  
 Radar  
 Radiometer  
 ResonanceSounder  
 RetardingPotentialAnalyser  
 Riometer  
 ScintillationDetector  
 SearchCoil  
 SolidStateDetector  
 Sounder  
 SpacecraftPotentialControl  
 SpectralPowerReceiver  
 Spectrometer  
 TimeOfFlight  
 Unspecified  
 WaveformReceiver

|                 |                    |
|-----------------|--------------------|
| <b>Integral</b> | <b>Enumeration</b> |
|-----------------|--------------------|

A flux measurement in a broad range of energy and solid angle.

Allowed Values:

Area  
 Bandwidth  
 SolidAngle

|                  |             |
|------------------|-------------|
| <b>Intensity</b> | <b>Item</b> |
|------------------|-------------|

The measurement of radiant or wave energy per unit detector area per unit bandwidth per unit solid angle per unit time.

|                       |             |
|-----------------------|-------------|
| <b>Interferometer</b> | <b>Item</b> |
|-----------------------|-------------|

An instrument to study the properties of two or more waves from the pattern of interference created by their superposition.

|                 |             |
|-----------------|-------------|
| <b>Interior</b> | <b>Item</b> |
|-----------------|-------------|

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

|   |             |
|---|-------------|
| <b>InterplanetaryShock</b>  | Item        |
| A shock propagating generally anti-sunward through the slower solar wind, often seen in front of CME-associated plasma clouds.  |             |
| <b>Interstellar</b>   | Item        |
| The region between stars outside of the star's heliopause.  |             |
| <b>InvestigationName</b>  | 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. |             |
| <b>Io</b>   | Item        |
| The innermost of the four round moons of the planet Jupiter.  |             |
| <b>Ion</b>  | Item        |
| An atom that has acquired a net electric charge by gaining or losing one or more electrons.(Note: $Z > 2$ )   |             |
| <b>IonChamber</b>   | Item        |
| A device in which the collected electrical charge from ionization in a gas-filled cavity is taken to be the proportion to some parameter (e.g. dose or exposure) of radiation field   |             |
| <b>IonComposition</b>   | 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.  |             |
| <b>IonDrift</b>   | Item        |
| A device which measures the current produced by the displacement of ambient ions on a grid, thereby allowing the determination of the ion trajectory and velocity.  |             |
| <b>Ionosphere</b>   | Enumeration |
| The charged or ionized gases surrounding a body that are nominally bound to the body by virtue of the gravitational attraction.<br>Allowed Values:<br>DRegion<br>ERegion<br>FRegion<br>Topside  |             |
| <b>Irradiance</b>   | Item        |
| 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. Irradiance data may be reported in any units (i.e. counts/s) due to, for example, being at a particular wavelength, or to being a not-fully-calibrated relative measurement.                |             |
| <b>J</b>  | Item        |
| Projection of a vector along the second named axis of a coordinate system. Typically the Y axis, but could be the T axis for an RTN coordinate system.  |             |
| <b>J2000</b>  | 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.   |             |
| <b>JK</b>   | Item        |
| A measure of the length of a position or measured vector projected into the j-k (typically Y-Z) plane of the coordinate system.   |             |

|   |             |
|---|-------------|
| <b>JPEG</b>   | Item        |
| A binary format for still images defined by the Joint Photographic Experts Group  |             |
| <b>JSM</b>  | Item        |
| Jovian Solar Magnetospheric - A coordinate system related to Jupiter where the X axis is from Jupiter to Sun, Z axis is northward in a plane containing the X axis and the Jovian dipole axis.  |             |
| <b>JSO</b>  | Item        |
| Jovian Solar Orbital - A coordinate system related to Jupiter where X anti-sunward, Y along the orbital velocity direction.   |             |
| <b>JSON</b>   | Item        |
| Javascript Object Notation - A lightweight data-interchange format.   |             |
| <b>Jupiter</b>  | Enumeration |
| The fifth planet from the sun in our solar system.  |             |
| <b>K</b>  | Item        |
| Projection of a vector along the third named axis of a coordinate system. Typically the Z axis, but could be the N axis for an RTN coordinate system.   |             |
| <b>K7699</b>  | Item        |
| A spectrum with a wavelength range centred at 769.9 nm. VSO nickname: K-7699 dopplergram with a range of 769.8 nm to 770.0 nm.  |             |
| <b>KSM</b>  | Item        |
| Kronian Solar Magnetospheric - A coordinate system related to Saturn where the X axis is anti-sunward, Z axis is northward in a plane containing the X axis and the Kronian dipole axis.  |             |
| <b>KSO</b>  | Item        |
| Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.  |             |
| <b>Keyword</b>  | Text        |
| A word or phrase that is relevant to the resource but does not exist in other documentary information.  |             |
| <b>LBHBand</b>  | Item        |
| Lyman-Birge-Hopfield band in the far ultraviolet range with wavelength range of 140nm to 170 nm.  |             |
| <b>LGM</b>  | 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) = $\text{SQRT}(B_x^2 + B_y^2)$ and D (declination angle) = $\arctan(B_y/B_x)$ |             |
| <b>LangmuirProbe</b>  | 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.  |             |
| <b>Language</b>   | Text        |
| The two character indicator of language selected from the ISO 630-1 codes for the representation of names of languages.   |             |
| <b>Latitude</b>   | Numeric     |
| The angular distance north (positive) or south (negative) from the equator, measured along the meridian passing through the point.  |             |



|   |           |
|---|-----------|
| <b>Layout</b>   | Item      |
| The structured arrangement of items in a collection.  |           |
| <b>LineDepth</b>  | Item      |
| The measure of the amount of absorption below the continuum (depth) in a particular wavelength or frequency in an absorption spectrum.  |           |
| <b>LineOfSight</b>  | 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.   |           |
| <b>Linear</b>   | Item      |
| Polarization where the E-field vector is confined to a given plane  |           |
| <b>LinearScale</b>  | Item      |
| Intervals which are equally spaced.   |           |
| <b>Location</b>   | Container |
| A position in space definable by a regional referencing system and geographic coordinates.<br>Sub-elements:<br>CoordinateSystemName<br>Elevation<br>Latitude<br>Longitude<br>ObservatoryRegion  |           |
| <b>LogScale</b>   | Item      |
| Intervals which are spaced proportionally to the logarithms of the values being represented.  |           |
| <b>LongWire</b>   | 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.  |           |
| <b>Longitude</b>  | Numeric   |
| The angular distance measured west (positive) or east (negative) from a north-south line called the Prime Meridian.   |           |
| <b>Low</b>  | Numeric   |
| The smallest value within a range of possible values.   |           |
| <b>MAG</b>  | 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 $Y = N \times Z$ , $X = Y \times Z$ . See Russell, 1971, and < <a href="http://cdpp.cnes.fr/00428.pdf">http://cdpp.cnes.fr/00428.pdf</a> > |           |
| <b>MATLAB_4</b>   | Item      |
| MATLAB Workspace save set, version 4. MAT-files are double-precision, binary, MATLAB format files. MATLAB is a proprietary product of The MathWorks.  |           |
| <b>MATLAB_6</b>   | Item      |
| MATLAB Workspace save set, version 6. MAT-files are double-precision, binary, MATLAB format files. MATLAB is a proprietary product of The MathWorks.  |           |
| <b>MATLAB_7</b>   | 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.  |           |

|  |      |
|--|------|
| <b>MD5</b>   | Item |
| Message Digest 5 (MD5) is a 128-bit message digest algorithm created in 1991 by Professor Ronald Rivest.   |      |
| <b>MFA</b>   | 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 < <a href="http://cdpp.cnes.fr/00428.pdf">http://cdpp.cnes.fr/00428.pdf</a> >  |      |
| <b>MHD</b>   | Item |
| Hydrodynamic waves in a magnetized plasma in which the background magnetic field plays a key role in controlling the wave propagation characteristics.   |      |
| <b>MIMEType</b>  | Text |
| Multipurpose Internet Mail Extensions (MIME) type and sub-type which characterizes the format of a file. MIME media types are define in RFC memorandum RFC 2046. Current MIME types are maintained by Internet Assigned Numbers Authority (IANA) at <a href="http://www.iana.org/assignments/media-types/index.html">http://www.iana.org/assignments/media-types/index.html</a> . Commonly used MIME types are: application/vnd.ms-powerpoint (ppt, pptx), application/vnd.ms-excel (xls, xlsx), text/richtext (rtx), application/postscript (eps, ps), application/pdf (pdf), application/xml-dtd (dtd), text/html (htm, html), text/xml (xsl, xml, xsd), application/x-dvi (dvi). If a document is compressed the specified MIME type should be for the uncompressed document. |      |
| <b>MPEG</b>  | Item |
| A digital format for movies defined by the Motion Picture Experts Group  |      |
| <b>MSO</b>   | Item |
| Mars/Mercury Solar Orbital A coordinate system related to Mars or Mercury. A coordinate system where, depending on the body (Mars or Mercury), X is anti-sunward, Y along the orbital velocity direction.  |      |
| <b>Magnetic</b>  | Item |
| The physical attribute attributed to a magnet or its equivalent.   |      |
| <b>MagneticCloud</b>   | 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.   |      |
| <b>MagneticField</b>   | Item |
| A region of space near a magnetized body where magnetic forces can be detected (as measured by methods such as Zeeman splitting, etc.).  |      |
| <b>Magnetogram</b>   | 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.")   |      |
| <b>Magnetograph</b>  | Item |
| A special type of magnetometer that records a time plot of the local magnetic field near the instrument; or a telescope capable of determining the magnetic field strength and/or direction on a distant object such as the Sun, using the Zeeman splitting or other spectral signatures of magnetization.   |      |
| <b>Magnetometer</b>  | Item |
| An instrument which measures the ambient magnetic field.   |      |
| <b>MagnetopauseCrossing</b>  | Item |
| A crossing of the interface between the shocked solar wind in the magnetosheath and the magnetic field and plasma in the magnetosphere.  |      |

|  |             |
|--|-------------|
| <b>Magnetosheath</b>   | Item        |
| The region between the bow shock and the magnetopause, characterized by very turbulent plasma.   |             |
| <b>MagnetosonicMachNumber</b>  | Item        |
| The ratio of the velocity of fast mode waves to the Alfven velocity.   |             |
| <b>Magnetosphere</b>   | 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  |             |
| RadiationBelt  |             |
| <b>Magnetotail</b>   | Item        |
| The region on the night side of the body where the magnetic field is stretched backwards by the force of the solar wind. For Earth, the magnetotail begins at a night-side radial distance of 10 $R_e$ ( $X > -10R_e$ ). |             |
| <b>Magnitude</b>   | Item        |
| A measure of the strength of a vector quantity or length of its representational vector.   |             |
| <b>Main</b>  | 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.  |             |
| <b>Mars</b>  | Enumeration |
| The fourth planet from the sun in our solar system.  |             |
| <b>Mass</b>  | Item        |
| The measure of inertia (mass) of individual objects (e.g., aerosols).  |             |
| <b>MassDensity</b>   | Item        |
| The mass of particles per unit volume.   |             |
| <b>MassNumber</b>  | Item        |
| The total number of protons and neutrons (together known as nucleons) in an atomic nucleus.  |             |
| <b>MassRange</b>   | Container   |
| The range of possible mass for a group of particle observations.   |             |
| Sub-elements:  |             |
| Bin  |             |
| High   |             |
| Low  |             |
| Units  |             |
| <b>MassSpectrometer</b>  | Item        |
| An instrument which distinguishes chemical species in terms of their different isotopic masses.  |             |
| <b>Maximum</b>   | Item        |
| The largest value of a batch or sample or the upper bound of a probability distribution.   |             |
| <b>MeasurementType</b>   | Enumeration |
| A characterization of the quantitative assessment of a phenomenon.   |             |
| Allowed Values:  |             |
| ActivityIndex  |             |
| Dopplergram  |             |
| Dust   |             |

ElectricField  
 EnergeticParticles  
 Ephemeris  
 ImageIntensity  
 InstrumentStatus  
 IonComposition  
 Irradiance  
 MagneticField  
 Magnetogram  
 NeutralAtomImages  
 NeutralGas  
 Profile  
 Radiance  
 Spectrum  
 ThermalPlasma  
 Waves  
 Waves.Active  
 Waves.Passive

|   |                    |
|---|--------------------|
| <b>Median</b>   | <b>Item</b>        |
| The measure of central tendency of a set of n. values computed by ordering the values and taking the value at position $(n. + 1) / 2$ when n. is odd or the arithmetic mean of the values at positions $n. / 2$ and $(n. / 2) + 1$ when n. is even. |                    |
| <b>Mercury</b>  | <b>Enumeration</b> |
| The first planet from the sun in our solar system.  |                    |
| <b>Mesosphere</b>   | <b>Item</b>        |
| The layer of the atmosphere that extends from the Stratosphere to a range of 80 km to 85 km, temperature decreasing with height.  |                    |
| <b>MetadataContact</b>  | <b>Item</b>        |
| An individual who can affect a change in the metadata describing a resource.  |                    |
| <b>MicrochannelPlate</b>  | <b>Item</b>        |
| An instrument used for the detection of elementary particles, ions, ultraviolet rays and soft X-rays constructed from very thin conductive glass capillaries.   |                    |
| <b>Microfiche</b>   | <b>Item</b>        |
| A sheet of microfilm on which many pages of material have been photographed; a magnification system is used to read the material.   |                    |
| <b>Microfilm</b>  | <b>Item</b>        |
| Film rolls on which materials are photographed at greatly reduced size; a magnification system is used to read the material.  |                    |
| <b>Microwave</b>  | <b>Item</b>        |
| Photons with a wavelength range: $1.00 \times 10^6$ to $1.50 \times 10^7$ nm  |                    |
| <b>Mimas</b>  | <b>Item</b>        |
| The smallest and least massive of the round moons of Saturn.  |                    |
| <b>Minimum</b>  | <b>Item</b>        |
| The smallest value of a batch or sample or the lower bound of a probability distribution.   |                    |
| <b>Miranda</b>  | <b>Item</b>        |
| The smallest and innermost round moon of Uranus.  |                    |
| <b>MirrorURL</b>  | <b>URL</b>         |
| A Uniform Resource Locator (URL) to an alternate location of a resource.  |                    |

|   |                    |
|---|--------------------|
| <b>Mixed</b>  | <b>Container</b>   |
| A parameter derived from more than one of the type of parameter. For example, plasma beta, the ratio of plasma particle energy density to the energy density of the magnetic field permeating the plasma, is "mixed."   |                    |
| Sub-elements:   |                    |
| MixedQuantity   |                    |
| ParticleType  |                    |
| Qualifier   |                    |
| <b>MixedQuantity</b>  | <b>Enumeration</b> |
| A characterization of the combined attributes of a quantity.  |                    |
| Allowed Values:   |                    |
| AkasofuEpsilon  |                    |
| AlfvenMachNumber  |                    |
| AlfvenVelocity  |                    |
| FrequencyToGyrofrequencyRatio   |                    |
| IMFClockAngle   |                    |
| MagnetosonicMachNumber  |                    |
| Other   |                    |
| PlasmaBeta  |                    |
| SolarUVFlux   |                    |
| TotalPressure   |                    |
| VCrossB   |                    |
| <b>ModeAmplitude</b>  | <b>Item</b>        |
| In helioseismology the magnitude of oscillation of waves of a particular geometry.  |                    |
| <b>Molecule</b>   | <b>Item</b>        |
| 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  |                    |
| <b>Moment</b>   | <b>Item</b>        |
| Parameters determined by integration over a distribution function convolved with a power of velocity.   |                    |
| <b>Moon</b>   | <b>Item</b>        |
| The only natural satellite of the Earth.  |                    |
| <b>MultispectralImager</b>  | <b>Item</b>        |
| An instrument which captures images at multiple spectral ranges.  |                    |
| <b>NCAR</b>   | <b>Item</b>        |
| 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. |                    |
| <b>NaD</b>  | <b>Item</b>        |
| 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.  |                    |
| <b>Name</b>   | <b>Text</b>        |
| A language unit by which a person or thing is known.  |                    |
| <b>NearEarth</b>  | <b>Item</b>        |
| The heliospheric region near the Earth which extends to and includes the area near the L1 and L2 Lagrange point.  |                    |
| <b>NearSurface</b>  | <b>Enumeration</b> |
| 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  
AuroralRegion  
EquatorialRegion  
Ionosphere  
Ionosphere.DRegion  
Ionosphere.ERegion  
Ionosphere.FRegion  
Ionosphere.Topside  
Mesosphere  
Plasmasphere  
PolarCap  
SouthAtlanticAnomalyRegion  
Stratosphere  
Thermosphere  
Troposphere

|  |             |
|--|-------------|
| Neptune  | Enumeration |
| The seventh planet from the sun in our solar system.   |             |
| NetCDF   | Item        |
| Unidata Program Center's Network Common Data Form (NetCDF). A self-describing portable data format for array-oriented data access. See <a href="http://my.unidata.ucar.edu/content/software/netcdf">http://my.unidata.ucar.edu/content/software/netcdf</a> |             |
| NeutralAtomImager  | Item        |
| An instrument which measures the quantity and properties of neutral particles over a range of angles. Measured properties can include mass and energy.   |             |
| NeutralAtomImages  | 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-of-sight trajectory.                         |             |
| NeutralGas   | Item        |
| Measurements of neutral atomic and molecular components of a gas.  |             |
| NeutralParticleDetector  | Item        |
| An instrument which measures the quantity and properties of neutral particles. Measured properties can include mass and plasma bulk densities.   |             |
| Neutron  | Item        |
| An elementary particle that has no net charge and is a constituent of atomic nuclei, and that has a mass slightly large than a proton ( $1.673 \times 10^{-24}$ gram.)   |             |
| Ni6768   | 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.  |             |
| None   | Item        |
| A lack or absence of anything.   |             |
| Note   | Text        |
| Information which is useful or important for the understanding of a value or parameter.  |             |
| NumberDensity  | Item        |
| The number of particles per unit volume.   |             |
| NumberFlux   | Item        |
| The number of particles passing a unit area in unit time, possibly also per unit energy (or  |             |

equivalent) and/or per unit look direction.

| NumericalData  | Container |
|--|-----------|
| <p>Data stored as numerical values in one or more specified formats. A Numerical Data resource is a type of "data product" which is a set of data that is uniformly processed and formatted, from one or more instruments, typically spanning the full duration of the observations of the relevant instrument(s). A data product may consist of Parameters stored in a collection of granules of successive time spans or a single data granule.</p>                              |           |
| <p>Sub-elements:</p>   |           |
| <ul style="list-style-type: none"> <li>AccessInformation</li> <li>Caveats</li> <li>Extension</li> <li>InputResourceID</li> <li>InstrumentID</li> <li>Keyword</li> <li>MeasurementType</li> <li>ObservedRegion</li> <li>Parameter</li> <li>ProcessingLevel</li> <li>ProviderName</li> <li>ProviderProcessingLevel</li> <li>ProviderResourceName</li> <li>ProviderVersion</li> <li>ResourceHeader</li> <li>ResourceID</li> <li>SpectralRange</li> <li>TemporalDescription</li> </ul> |           |

| Oberon   | Item |
|--|------|
| <p>The second-largest and second most massive moon of Uranus, and the ninth most massive moon in the Solar System.</p> |      |

| ObservationExtent   | Container |
|---|-----------|
| <p>The spatial area encompassed by an observation.</p>  |           |
| <p>Sub-elements:</p>  |           |
| <ul style="list-style-type: none"> <li>Note</li> <li>ObservedRegion</li> <li>StartLocation</li> <li>StopLocation</li> </ul> |           |

| Observatory  | Container |
|--|-----------|
| <p>The host (spacecraft, network, facility) for instruments making observations, or a family of closely related hosts.</p>   |           |
| <p>Sub-elements:</p>   |           |
| <ul style="list-style-type: none"> <li>Extension</li> <li>Location</li> <li>ObservatoryGroupID</li> <li>OperatingSpan</li> <li>ResourceHeader</li> <li>ResourceID</li> </ul> |           |

| ObservatoryGroupID  | Text |
|---|------|
| <p>The identifier of an Observatory resource which the referring resource is a member of.</p> |      |

| ObservatoryID                                     | Text |
|---|------|
| <p>The identifier of an Observatory resource.</p> |      |

| ObservatoryRegion  | Enumeration |
|--|-------------|
| <p>A spatial location distinguished by certain natural features or physical characteristics where an observatory is located.</p> |             |
| <p>Allowed Values:</p>   |             |
| <ul style="list-style-type: none"> <li>Asteroid</li> </ul>   |             |

Comet  
 Earth  
 Earth.Magnetosheath  
 Earth.Magnetosphere  
 Earth.Magnetosphere.Magnetotail  
 Earth.Magnetosphere.Main  
 Earth.Magnetosphere.Polar  
 Earth.Magnetosphere.RadiationBelt  
 Earth.Moon  
 Earth.NearSurface  
 Earth.NearSurface.Atmosphere  
 Earth.NearSurface.AuroralRegion  
 Earth.NearSurface.EquatorialRegion  
 Earth.NearSurface.Ionosphere  
 Earth.NearSurface.Ionosphere.DRegion  
 Earth.NearSurface.Ionosphere.ERegion  
 Earth.NearSurface.Ionosphere.FRegion  
 Earth.NearSurface.Ionosphere.Topside  
 Earth.NearSurface.Mesosphere  
 Earth.NearSurface.Plasmasphere  
 Earth.NearSurface.PolarCap  
 Earth.NearSurface.SouthAtlanticAnomalyRegion  
 Earth.NearSurface.Stratosphere  
 Earth.NearSurface.Thermosphere  
 Earth.NearSurface.Troposphere  
 Earth.Surface  
 Heliosphere  
 Heliosphere.Heliosheath  
 Heliosphere.Inner  
 Heliosphere.NearEarth  
 Heliosphere.Outer  
 Heliosphere.Remote1AU  
 Interstellar  
 Jupiter  
 Jupiter.Callisto  
 Jupiter.Europa  
 Jupiter.Ganymede  
 Jupiter.Io  
 Jupiter.Magnetosphere  
 Jupiter.Magnetosphere.Magnetotail  
 Jupiter.Magnetosphere.Main  
 Jupiter.Magnetosphere.Polar  
 Jupiter.Magnetosphere.RadiationBelt  
 Mars  
 Mars.Deimos  
 Mars.Magnetosphere  
 Mars.Magnetosphere.Magnetotail  
 Mars.Magnetosphere.Main  
 Mars.Magnetosphere.Polar  
 Mars.Magnetosphere.RadiationBelt  
 Mars.Phobos  
 Mercury  
 Mercury.Magnetosphere  
 Mercury.Magnetosphere.Magnetotail  
 Mercury.Magnetosphere.Main  
 Mercury.Magnetosphere.Polar  
 Mercury.Magnetosphere.RadiationBelt  
 Neptune  
 Pluto  
 Saturn  
 Saturn.Dione  
 Saturn.Enceladus  
 Saturn.Iapetus  
 Saturn.Magnetosphere



Saturn.Magnetosphere.Magnetotail  
 Saturn.Magnetosphere.Main  
 Saturn.Magnetosphere.Polar  
 Saturn.Magnetosphere.RadiationBelt  
 Saturn.Mimas  
 Saturn.Rhea  
 Saturn.Tethys  
 Saturn.Titan  
 Sun  
 Sun.Chromosphere  
 Sun.Corona  
 Sun.Interior  
 Sun.Photosphere  
 Sun.TransitionRegion  
 Uranus  
 Uranus.Ariel  
 Uranus.Magnetosphere  
 Uranus.Magnetosphere.Magnetotail  
 Uranus.Magnetosphere.Main  
 Uranus.Magnetosphere.Polar  
 Uranus.Magnetosphere.RadiationBelt  
 Uranus.Miranda  
 Uranus.Oberon  
 Uranus.Puck  
 Uranus.Titania  
 Uranus.Umbriel  
 Venus  
 Venus.Magnetosphere  
 Venus.Magnetosphere.Magnetotail  
 Venus.Magnetosphere.Main  
 Venus.Magnetosphere.Polar  
 Venus.Magnetosphere.RadiationBelt

**ObservedBy****Item**

Detected or originating from another resource.

**ObservedRegion****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.RadiationBelt  
 Earth.Moon  
 Earth.NearSurface  
 Earth.NearSurface.Atmosphere  
 Earth.NearSurface.AuroralRegion  
 Earth.NearSurface.EquatorialRegion  
 Earth.NearSurface.Ionosphere  
 Earth.NearSurface.Ionosphere.DRegion  
 Earth.NearSurface.Ionosphere.ERegion  
 Earth.NearSurface.Ionosphere.FRegion  
 Earth.NearSurface.Ionosphere.Topside  
 Earth.NearSurface.Mesosphere  
 Earth.NearSurface.Plasmasphere

Earth.NearSurface.PolarCap  
 Earth.NearSurface.SouthAtlanticAnomalyRegion  
 Earth.NearSurface.Stratosphere  
 Earth.NearSurface.Thermosphere  
 Earth.NearSurface.Troposphere  
 Earth.Surface  
 Heliosphere  
 Heliosphere.Heliosheath  
 Heliosphere.Inner  
 Heliosphere.NearEarth  
 Heliosphere.Outer  
 Heliosphere.Remote1AU  
 Interstellar  
 Jupiter  
 Jupiter.Callisto  
 Jupiter.Europa  
 Jupiter.Ganymede  
 Jupiter.Io  
 Jupiter.Magnetosphere  
 Jupiter.Magnetosphere.Magnetotail  
 Jupiter.Magnetosphere.Main  
 Jupiter.Magnetosphere.Polar  
 Jupiter.Magnetosphere.RadiationBelt  
 Mars  
 Mars.Deimos  
 Mars.Magnetosphere  
 Mars.Magnetosphere.Magnetotail  
 Mars.Magnetosphere.Main  
 Mars.Magnetosphere.Polar  
 Mars.Magnetosphere.RadiationBelt  
 Mars.Phobos  
 Mercury  
 Mercury.Magnetosphere  
 Mercury.Magnetosphere.Magnetotail  
 Mercury.Magnetosphere.Main  
 Mercury.Magnetosphere.Polar  
 Mercury.Magnetosphere.RadiationBelt  
 Neptune  
 Pluto  
 Saturn  
 Saturn.Dione  
 Saturn.Enceladus  
 Saturn.Iapetus  
 Saturn.Magnetosphere  
 Saturn.Magnetosphere.Magnetotail  
 Saturn.Magnetosphere.Main  
 Saturn.Magnetosphere.Polar  
 Saturn.Magnetosphere.RadiationBelt  
 Saturn.Mimas  
 Saturn.Rhea  
 Saturn.Tethys  
 Saturn.Titan  
 Sun  
 Sun.Chromosphere  
 Sun.Corona  
 Sun.Interior  
 Sun.Photosphere  
 Sun.TransitionRegion  
 Uranus  
 Uranus.Ariel  
 Uranus.Magnetosphere  
 Uranus.Magnetosphere.Magnetotail  
 Uranus.Magnetosphere.Main  
 Uranus.Magnetosphere.Polar

Uranus.Magnetosphere.RadiationBelt  
 Uranus.Miranda  
 Uranus.Oberon  
 Uranus.Puck  
 Uranus.Titania  
 Uranus.Umbriel  
 Venus  
 Venus.Magnetosphere  
 Venus.Magnetosphere.Magnetotail  
 Venus.Magnetosphere.Main  
 Venus.Magnetosphere.Polar  
 Venus.Magnetosphere.RadiationBelt

|   |                  |
|---|------------------|
| <b>Offline</b>  | <b>Item</b>      |
| Not directly accessible electronically. This includes resources which may to be moved to an on-line status in response to a given request.  |                  |
| <b>Online</b>   | <b>Item</b>      |
| Directly accessible electronically.   |                  |
| <b>Open</b>   | <b>Item</b>      |
| Access is granted to everyone.  |                  |
| <b>OperatingSpan</b>  | <b>Container</b> |
| The interval in time from the first point at which an instrument or spacecraft was producing and sending data until the last such time, ignoring possible gaps.<br>Sub-elements:<br>Note<br>StartDate<br>StopDate |                  |
| <b>Optical</b>  | <b>Item</b>      |
| Photons with a wavelength range: 380 to 760 nm  |                  |
| <b>OrganizationName</b>   | <b>Text</b>      |
| 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.   |                  |
| <b>Other</b>  | <b>Item</b>      |
| Not classified with more specific terms. The context of its usage may be described in related text.   |                  |
| <b>Outer</b>  | <b>Item</b>      |
| The region of the heliosphere extending radially outward from just outside 1 AU to the heliospheric termination shock.  |                  |
| <b>PDF</b>  | <b>Item</b>      |
| A document expressed in the Portable Document Format (PDF) as defined by Adobe.   |                  |
| <b>PNG</b>  | <b>Item</b>      |
| A digital format for still images. Portable Network Graphics (PNG)  |                  |
| <b>Parallel</b>   | <b>Item</b>      |
| Having the same direction as a given direction  |                  |
| <b>Parameter</b>  | <b>Container</b> |
| 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.<br>Sub-elements:<br>Cadence<br>CadenceMax              |                  |

CadenceMin  
 Caveats  
 CoordinateSystem  
 Description  
 Field  
 FillValue  
 Mixed  
 Name  
 ParameterKey  
 Particle  
 RenderingHints  
 Set  
 Structure  
 Support  
 UCD  
 Units  
 UnitsConversion  
 ValidMax  
 ValidMin  
 Wave

|   |                    |
|---|--------------------|
| <b>ParameterKey</b>   | <b>Text</b>        |
| <p>The name or identifier which can be used to access the parameter in the resource. The associated value is dependent on the service used to access the resource. For columnar ASCII data, use "Column_X" for a single-element parameter and "Column_X-Column_Y" for a multi-element parameter, where X and Y are the relevant column index. The first column index is 1.</p>  |                    |
| <b>ParentID</b>   | <b>Text</b>        |
| <p>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 prescribed by the containing resource.</p>  |                    |
| <b>PartOf</b>   | <b>Item</b>        |
| <p>A portion of a larger resource.</p>  |                    |
| <b>PartiallyRestricted</b>  | <b>Item</b>        |
| <p>Some portions of the resource have restricted access, the rest is open access. Typically this is for accumulating data collections where some data is under review before being publicly released.</p>   |                    |
| <b>Particle</b>   | <b>Container</b>   |
| <p>A description of the types of particles observed in the measurement. This includes both direct observations and inferred observations.<br/>         Sub-elements:</p> <ul style="list-style-type: none"> <li>AtomicNumber</li> <li>AzimuthalAngleRange</li> <li>EnergyRange</li> <li>MassRange</li> <li>ParticleQuantity</li> <li>ParticleType</li> <li>PitchAngleRange</li> <li>PolarAngleRange</li> <li>Qualifier</li> </ul> |                    |
| <b>ParticleCorrelator</b>   | <b>Item</b>        |
| <p>An instrument which correlates particle flux to help identify wave/particle interactions.</p>  |                    |
| <b>ParticleDetector</b>   | <b>Item</b>        |
| <p>An instrument which detects particle flux!!!</p>   |                    |
| <b>ParticleQuantity</b>   | <b>Enumeration</b> |

A characterization of the physical properties of the particle.

Allowed Values:

ArrivalDirection  
AtomicNumberDetected  
AverageChargeState  
ChargeState  
CountRate  
Counts  
Energy  
EnergyDensity  
EnergyFlux  
Entropy  
FlowSpeed  
FlowVelocity  
Fluence  
Gyrofrequency  
HeatFlux  
Mass  
MassDensity  
MassNumber  
NumberDensity  
NumberFlux  
ParticleRadius  
Phase-SpaceDensity  
PlasmaFrequency  
Pressure  
SonicMachNumber  
SoundSpeed  
Temperature  
ThermalSpeed  
Velocity

**ParticleRadius** Item

The mean radius for a Gaussian distribution of particles with an axial ratio of 2 and a distribution width that varies as 0.5 radius. A value of zero means no cloud was detected.

**ParticleType** Enumeration

A characterization of the kind of particle observed by the measurement.

Allowed Values:

Aerosol  
AlphaParticle  
Atom  
Dust  
Electron  
Ion  
Molecule  
Neutron  
Proton

**Passive** Item

Movement or effect produced by outside influence. A passive measurement is one which does not produce a transmission or excitation as a part of the measurement cycle.

**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.

|  |             |
|--|-------------|
| <b>Person</b>  | Container   |
| An individual human being.<br>Sub-elements:<br><ul style="list-style-type: none"> <li>Address</li> <li>Email</li> <li>Extension</li> <li>FaxNumber</li> <li>Note</li> <li>OrganizationName</li> <li>PersonName</li> <li>PhoneNumber</li> <li>ReleaseDate</li> <li>ResourceID</li> </ul>  |             |
| <b>PersonID</b>  | Text        |
| The identifier assigned to a Person description.   |             |
| <b>PersonName</b>  | Text        |
| The words used to address an individual.   |             |
| <b>Perturbation</b>  | Item        |
| Variations in the state of a system.   |             |
| <b>Phase</b>   | Item        |
| A point or portion in a recurring series of changes.   |             |
| <b>PhaseAngle</b>  | Item        |
| Phase difference between two or more waves, normally expressed in degrees.   |             |
| <b>PhaseSpaceDensity</b>   | Item        |
| The number of particles per unit volume in the six-dimensional space of position and velocity.   |             |
| <b>PhenomenonType</b>  | Enumeration |
| The characteristics or categorization of an event type.<br>Allowed Values:<br><ul style="list-style-type: none"> <li>ActiveRegion</li> <li>Aurora</li> <li>BowShockCrossing</li> <li>CoronalHole</li> <li>CoronalMassEjection</li> <li>EITWave</li> <li>EnergeticSolarParticleEvent</li> <li>ForbushDecrease</li> <li>GeomagneticStorm</li> <li>InterplanetaryShock</li> <li>MagneticCloud</li> <li>MagnetopauseCrossing</li> <li>RadioBurst</li> <li>SectorBoundaryCrossing</li> <li>SolarFlare</li> <li>SolarWindExtreme</li> <li>StreamInteractionRegion</li> <li>Substorm</li> </ul> |             |
| <b>Phobos</b>  | Item        |
| The larger and inner most moon of Mars.  |             |
| <b>PhoneNumber</b>   | 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.

|   |                  |
|---|------------------|
| <b>Photograph</b>   | <b>Item</b>      |
| An image (positive or negative) registered on a piece of photo-sensitive paper  |                  |
| <b>PhotographicPlate</b>  | <b>Item</b>      |
| A rigid (typically glass) medium that functions like film. Its rigidity is for guarding against image distortion due to medium deformation (caused by heat and humidity). Photographic plates are often used for astronomical photography.      |                  |
| <b>Photometer</b>   | <b>Item</b>      |
| An instrument which measures the strength of electromagnetic radiation within a spectral band which can range from ultraviolet to infrared and includes the visible spectrum.   |                  |
| <b>PhotomultiplierTube</b>  | <b>Item</b>      |
| A vacuum phototube that is an extremely sensitive detector of light in the ultraviolet, visible, and near-infrared ranges of the electromagnetic spectrum.  |                  |
| <b>Photon</b>   | <b>Item</b>      |
| Electromagnetic waves detected by techniques that utilize their corpuscular character (e.g., CCD, CMOS, photomultipliers).  |                  |
| <b>Photopolarimeter</b>   | <b>Item</b>      |
| An instrument which measures the intensity and polarization or radiant energy. A photopolarimeter is a combination of a photometer and a polarimeter.   |                  |
| <b>Photosphere</b>  | <b>Item</b>      |
| 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.   |                  |
| <b>PitchAngleRange</b>  | <b>Container</b> |
| The range of possible pitch angles for a group of particle observations.<br>Sub-elements:   |                  |
|   | Bin              |
|   | High             |
|   | Low              |
|   | Units            |
| <b>PlasmaBeta</b>   | <b>Item</b>      |
| The ratio of the plasma pressure (nkT) to the magnetic pressure ( $B^2/2\mu_0$ ) of the $SUM(nkT)/(B^2/2\mu_0)$ .   |                  |
| <b>PlasmaFrequency</b>  | <b>Item</b>      |
| A number-density-dependent characteristic frequency of a plasma.  |                  |
| <b>PlasmaWaves</b>  | <b>Item</b>      |
| Self-consistent collective oscillations of particles and fields (electric and magnetic) in a plasma.  |                  |
| <b>Plasmagram</b>   | <b>Item</b>      |
| The characterization of signal strengths in active sounding measurements as a function of virtual range or signal delay time and sounding frequency. A Plasmagram is also referred to as an Ionogram.   |                  |
| <b>Plasmasphere</b>   | <b>Item</b>      |
| 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. |                  |
| <b>Platform</b>   | <b>Item</b>      |
| A collection of components which can be positioned and oriented as a single unit. A platform  |                  |

may contain other platforms. For example, a spacecraft is a platform which may have components that can be articulated and are also considered platforms.

|  |                  |
|--|------------------|
| <b>Pluto</b>   | <b>Item</b>      |
| The ninth (sub)planet from the sun in our solar system.  |                  |
| <b>Polar</b>   | <b>Item</b>      |
| 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 auroral zone.  |                  |
| <b>PolarAngle</b>  | <b>Item</b>      |
| The angle between the position or measured vector and the k-axis of the coordinate system. Mathematically defined as $\arctan([\text{SQRT}(i^2+j^2)]/k)$ . This term could be also applied to angles between the vector and other components, for example the IMF cone angle defined as $\arccos(B_x/B_t)$ .   |                  |
| <b>PolarAngleRange</b>   | <b>Container</b> |
| The range of possible polar angles for a group of energy observations. Defaults units are degrees.   |                  |
| Sub-elements:  |                  |
| Bin  |                  |
| High   |                  |
| Low  |                  |
| Units  |                  |
| <b>PolarCap</b>  | <b>Item</b>      |
| The areas of the globe surrounding the poles and consisting of the region north of 60 degrees north latitude and the region south of 60 degrees south latitude.  |                  |
| <b>Polarization</b>  | <b>Item</b>      |
| 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.  |                  |
| <b>Positional</b>  | <b>Item</b>      |
| 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.  |                  |
| <b>Poster</b>  | <b>Item</b>      |
| A set of information arranged on a single page or sheet, typically in a large format.  |                  |
| <b>Postscript</b>  | <b>Item</b>      |
| A page description programming language created by Adobe Systems Inc. that is a device-independent industry standard for representing text and graphics.   |                  |
| <b>Potential</b>   | <b>Item</b>      |
| The work required per unit charge to move a charge from a reference point to a point at infinity (electric potential is defined to be zero). The electric potential of a spacecraft is often referred to as the "spacecraft potential". The spacecraft potential is the electric potential of the spacecraft relative to the potential of the nearby plasma. The spacecraft potential is non-zero because the spacecraft charges to the level that the emitted photoelectron flux going to infinity is balanced by the plasma electron flux to the spacecraft. |                  |
| <b>PoyntingFlux</b>  | <b>Item</b>      |
| Electromagnetic energy flux transported by a wave characterized as the rate of energy transport per unit area per steradian.   |                  |
| <b>Presentation</b>  | <b>Item</b>      |
| A set of information that is used when communicating to an audience.   |                  |



|  |             |
|--|-------------|
| <b>Pressure</b>  | Item        |
| The force per unit area exerted by a particle distribution or field.   |             |
| <b>PrincipalInvestigator</b>   | Item        |
| An individual who is the administrative and scientific lead for an investigation.  |             |
| <b>Print</b>   | Item        |
| A sheet of any written or printed material which may include notes or graphics. Multiple printed pages may be bound into a manuscript or book.   |             |
| <b>PriorID</b>   | Text        |
| The resource identifier for a resource that is superseded or replaced by a resource.   |             |
| <b>Probable</b>  | Item        |
| Likely given the available evidence. Considered in the range of 4-7 on a scale of 0-10.  |             |
| <b>ProcessingLevel</b>   | Enumeration |
| The standard classification of the processing performed on the product.<br>Allowed Values:<br>Calibrated<br>Raw<br>Uncalibrated  |             |
| <b>ProductKey</b>  | Text        |
| The key (identifier) of the resource within a Repository. This is a local identifier which can be used to retrieve or locate the resource.   |             |
| <b>Profile</b>   | Item        |
| Measurements of a quantity as a function of height above an object such as the limb of a body.   |             |
| <b>ProjectScientist</b>  | Item        |
| An individual who is an expert in the phenomenon and related physics explored by the project. A project scientist may also have a managerial role within the project.                                    |             |
| <b>Projection</b>  | Enumeration |
| A measure of the length of a position or measured vector as projected into a plane of the coordinate system.<br>Allowed Values:<br>IJ<br>IK<br>JK  |             |
| <b>PropagationTime</b>   | Item        |
| Time difference between transmission and reception of a wave in an active wave experiment.   |             |
| <b>ProportionalCounter</b>   | Item        |
| An instrument which measures energy of ionization radiation based on interactions with a gas.  |             |
| <b>Proteus</b>   | Item        |
| The second largest moon of Neptune.  |             |
| <b>Proton</b>  | 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 $1.673 \times 10^{(-24)}$ gram. |             |
| <b>ProviderName</b>  | Text        |
| The source, or original provider, of the data (for example, PDS PPI)   |             |
| <b>ProviderProcessingLevel</b>   | Text        |
| The provider specific classification of the processing performed on the product.   |             |

|  |             |
|--|-------------|
| <b>ProviderResourceName</b>  | Text        |
| A short textual description of a resource used by the provider which may be used to identify a resource.   |             |
| <b>ProviderVersion</b>   | 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.   |             |
| <b>Pseudo</b>  | Item        |
| Similar to or having the appearance of something else. Can be used to indicate an estimation or approximation of a particular quantity.  |             |
| <b>Publisher</b>   | Item        |
| An individual, organization, institution or government department responsible for the production and dissemination of a document.  |             |
| <b>Puck</b>  | Item        |
| The largest inner spherical moon of Uranus.  |             |
| <b>QuadrisphericalAnalyser</b>   | Item        |
| An instrument used for the 3-D detection of plasma, energetic electrons and ions, and for positive-ion composition measurements.   |             |
| <b>Qualifier</b>   | Enumeration |
| Characterizes the refinement to apply to a type or attribute of a quantity.<br>Allowed Values:   |             |
| Anisotropy<br>Array<br>Average<br>Characteristic<br>Circular<br>Column<br>Component<br>Component.I<br>Component.J<br>Component.K<br>Confidence<br>Core<br>CrossSpectrum<br>Deviation<br>Differential<br>Direction<br>DirectionAngle<br>DirectionAngle.AzimuthAngle<br>DirectionAngle.ElevationAngle<br>DirectionAngle.PolarAngle<br>Directional<br>Field-Aligned<br>Fit<br>Group<br>Halo<br>Integral<br>Integral.Area<br>Integral.Bandwidth<br>Integral.SolidAngle<br>LineOfSight<br>Linear<br>Magnitude<br>Maximum<br>Median<br>Minimum<br>Moment |             |

Parallel  
 Peak  
 Perpendicular  
 Perturbation  
 Phase  
 PhaseAngle  
 Projection  
 Projection.IJ  
 Projection.IK  
 Projection.JK  
 Pseudo  
 Ratio  
 Scalar  
 Spectral  
 StandardDeviation  
 StokesParameters  
 Strahl  
 Superhalo  
 Symmetric  
 Tensor  
 Total  
 Trace  
 Uncertainty  
 Variance  
 Vector

|          |         |
|----------|---------|
| 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/>

|     |      |
|-----|------|
| RTN | Item |
|-----|------|

Radial Tangential Normal. Typically centered at a spacecraft. Used for IMF and plasma V vectors. The X axis (radial) is set as the primary axis, and is defined as the axis pointing from the spacecraft to the Sun. The Z axis (tangential) is set as the secondary axis, and is defined as that portion of the solar North rotational axis which is perpendicular to the primary axis. The Y axis (normal) is defined as Z cross X.

|       |      |
|-------|------|
| 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 describes 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.

|               |      |
|---------------|------|
| RadiationBelt | Item |
|---------------|------|

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

|            |      |
|------------|------|
| RadioBurst | 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" consisting 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" consisting of narrow-band bursts that sweep rapidly (seconds) from decimeter to dekameter wavelengths (500 - 0.5 MHz); and "Type IV" consisting of a smooth continuum of broad-band bursts primarily in the meter range (300 - 30 MHz).

|   |                |
|---|----------------|
| <b>RadioFrequency</b>   | Item           |
| Photons with a wavelength range: 100,000 to 1.00x10 <sup>11</sup> nm  |                |
| <b>Radiometer</b>   | Item           |
| An instrument for detecting or measuring radiant energy. Radiometers are commonly limited to infrared radiation.  |                |
| <b>Ratio</b>  | Item           |
| The relative magnitudes of two quantities.  |                |
| <b>Raw</b>  | Item           |
| Data in its original state with no processing to account for calibration!!!   |                |
| <b>Registry</b>   | Container      |
| A location or facility where resources are cataloged.   |                |
| Sub-elements:   |                |
|   | AccessURL      |
|   | Extension      |
|   | ResourceHeader |
|   | ResourceID     |
| <b>RelativeStopDate</b>   | Duration       |
| An indication of the nominal end date relative to the present.  |                |
| <b>ReleaseDate</b>  | 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. |                |
| <b>Remote1AU</b>  | Item           |
| A roughly toroidal region that includes the Earth's orbit, but exclusive of the region near the Earth.  |                |
| <b>RenderingAxis</b>  | Enumeration    |
| A reference component of a plot or rendering of data. A plot typically is a 2-dimensional rendering with a horizontal and vertical axis. A third dimension can be introduced with a color coding of the rendered data.  |                |
| Allowed Values:   |                |
|   | ColorBar       |
|   | Horizontal     |
|   | Vertical       |
| <b>RenderingHints</b>   | Container      |
| Attributes to aid in the rendering of parameter.  |                |
| Sub-elements:   |                |
|   | AxisLabel      |
|   | DisplayType    |
|   | Index          |
|   | RenderingAxis  |
|   | ScaleMax       |
|   | ScaleMin       |
|   | ScaleType      |
|   | ValueFormat    |
| <b>Report</b>   | Item           |
| A document which describes the findings of some individual or group.  |                |
| <b>Repository</b>   | Container      |
| A location or facility where resources are stored.  |                |

## Sub-elements:

AccessURL  
 Extension  
 ResourceHeader  
 ResourceID

**RepositoryID** Text

The identifier of an Repository resource.

**ResonanceSounder** 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.

**ResourceHeader** Container

Attributes of a resource which pertain to the provider of the resource and descriptive information about the resource.

## Sub-elements:

Acknowledgement  
 AlternateName  
 Association  
 Contact  
 Description  
 ExpirationDate  
 InformationURL  
 PriorID  
 ReleaseDate  
 ResourceName

**ResourceID** 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.

**ResourceName** 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.

**RetardingPotentialAnalyser** Item

An instrument which measures ion temperatures and ion concentrations using a planar ion trap.

**RevisionOf** Item

A modified version of a resource instance.

**Rhea** Item

The second-largest moon of Saturn and the ninth-largest moon in the Solar System.

**Riometer** Item

An instrument which measure the signal strength in various directions of the galactic 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:

ArchiveSpecialist

Co-Investigator  
 Contributor  
 DataProducer  
 Deputy-PI  
 Former-PI  
 GeneralContact  
 MetadataContact  
 PrincipalInvestigator  
 ProjectScientist  
 Publisher  
 Scientist  
 TeamLeader  
 TeamMember  
 TechnicalContact

### **S3\_BUCKET** Item

A container of objects that comply with the Amazon Simple Storage Service (S3) specifications. A bucket has a unique, user-assigned key (name). A bucket can contain any number of objects with an aggregate size of 5 gigabytes. A bucket may be accompanied by up to 2 kilobytes of metadata.

### **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/coord\\_des.html](http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html)

### **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.

### **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.

### **SSE\_L** Item

Selenocentric Solar Ecliptic. The X axis points from the center of the Earth's moon to the sun,

the Z axis is normal to the ecliptic plane, positive northward. And the Y axis completes the right-handed set of axes.

|   |             |
|---|-------------|
| <b>Saturn</b>   | Enumeration |
| The sixth planet from the sun in our solar system.  |             |
| <b>Scalar</b>   | Item        |
| A quantity that is completely specified by its magnitude and has no direction.  |             |
| <b>ScaleMax</b>   | Numeric     |
| The maximum value that the variable is expected to attain. Used, for example, by automated plotting software.   |             |
| <b>ScaleMin</b>   | Numeric     |
| The minimum value that the variable is expected to attain. Used, for example, by automated plotting software.   |             |
| <b>ScaleType</b>  | Enumeration |
| The scaling to apply to an axis. If this attribute is not present, linear scale should be assumed.<br>Allowed Values:<br>LinearScale<br>LogScale  |             |
| <b>Scientist</b>  | Item        |
| An individual who is an expert in the phenomenon and related physics represented by the resource.   |             |
| <b>ScintillationDetector</b>  | Item        |
| An instrument which detects fluorescences of a material which is excited by high energy (ionizing) electromagnetic or charged particle radiation.   |             |
| <b>SearchCoil</b>   | Item        |
| 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.   |             |
| <b>SectorBoundaryCrossing</b>   | Item        |
| A sector boundary crossing is a transit by a spacecraft across the heliospheric current sheet separating the dominantly outward (away-from-the-sun) interplanetary magnetic field of one hemisphere of the heliosphere from the dominantly inward (toward-the-sun) polarity of the other hemisphere. Such crossings have multi-day intervals of opposite IMF dominant polarities on either side.  |             |
| <b>Service</b>  | Container   |
| A location or facility that can perform a well defined task.<br>Sub-elements:<br>AccessURL<br>Extension<br>ResourceHeader<br>ResourceID   |             |
| <b>Set</b>  | Text        |
| A collection of items for a particular purpose.   |             |
| <b>Size</b>   | Sequence    |
| The number of elements in each dimension of a multi-dimensional array. A scalar has a size of 1. A multi-dimensional vector will have a size for each dimension. 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 <sup>n</sup> . |             |

|  |                    |
|--|--------------------|
| <b>SoftXRays</b>   | <b>Item</b>        |
| X-Rays with an energy range of 0.12 keV to 12 keV.   |                    |
| <b>SolarFlare</b>  | <b>Item</b>        |
| 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.                  |                    |
| <b>SolarUVFlux</b>   | <b>Item</b>        |
| The amount of Ultraviolet energy originating from the Sun passing through a unit area in a unit time.  |                    |
| <b>SolarWindExtreme</b>  | <b>Item</b>        |
| Intervals of unusually large or small values of solar wind attributes such as flow speed and ion density.  |                    |
| <b>SolidAngle</b>  | <b>Item</b>        |
| Integration over the angle in three-dimensional space that an object subtends at a point.  |                    |
| <b>SolidStateDetector</b>  | <b>Item</b>        |
| A detector of the charge carriers (electrons and holes) generated in semiconductors by energy deposited by gamma ray photons. Also known as a "semiconductor detector".  |                    |
| <b>SonicMachNumber</b>   | <b>Item</b>        |
| The ratio of the bulk flow speed to the speed of sound in the medium.  |                    |
| <b>SoundSpeed</b>  | <b>Item</b>        |
| The speed at which sound travels through a medium.   |                    |
| <b>Sounder</b>   | <b>Item</b>        |
| An instrument which measures the radiances from an object. A sounder may measure radiances at multiple spectral ranges.  |                    |
| <b>Source</b>  | <b>Container</b>   |
| The location and attributes of an object.<br>Sub-elements:<br>Checksum<br>DataExtent<br>MirrorURL<br>SourceType<br>URL   |                    |
| <b>SourceType</b>  | <b>Enumeration</b> |
| A characterization of the function or purpose of the source.<br>Allowed Values:<br>Ancillary<br>Browse<br>Data<br>Layout<br>Thumbnail  |                    |
| <b>SouthAtlanticAnomalyRegion</b>  | <b>Item</b>        |
| The region where the 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. |                    |
| <b>SpacecraftOrbitPlane</b>  | <b>Item</b>        |
| A coordinate system where X lies in the plane normal to and in the direction of motion of the spacecraft, Z is normal to this plane and Y completes the triad in a right-handed coordinate system.                           |                    |



|   |                    |
|---|--------------------|
| <b>SpacecraftPotentialControl</b>   | <b>Item</b>        |
| An instrument to control the electric potential of a spacecraft with respect to the ambient plasma by emitting a variable current of positive ions.       |                    |
| <b>Spase</b>  | <b>Container</b>   |
| Space Physics Archive Search and Extract (SPASE). The outermost container or envelope for SPASE metadata. This indicates the start of the SPASE metadata. |                    |
| Sub-elements:   |                    |
| Annotation  |                    |
| Catalog   |                    |
| DisplayData   |                    |
| Document  |                    |
| Granule   |                    |
| Instrument  |                    |
| NumericalData   |                    |
| Observatory   |                    |
| Person  |                    |
| Registry  |                    |
| Repository  |                    |
| Service   |                    |
| Version   |                    |
| <b>Specification</b>  | <b>Item</b>        |
| A detailed description of the requirements and other aspects of an object or component that may be used to develop an implementation.                     |                    |
| <b>Spectral</b>   | <b>Item</b>        |
| Characterized as a range or continuum of frequencies  |                    |
| <b>SpectralPowerReceiver</b>  | <b>Item</b>        |
| A radio receiver which determines the power spectral density of the electric or magnetic field, or both, at one or more frequencies.                      |                    |
| <b>SpectralRange</b>  | <b>Enumeration</b> |
| The general term used to describe wavelengths or frequencies within a given span of values for those quantities.  |                    |
| Allowed Values:   |                    |
| CaK   |                    |
| ExtremeUltraviolet  |                    |
| FarUltraviolet  |                    |
| GammaRays   |                    |
| Halpa   |                    |
| HardXrays   |                    |
| He10830   |                    |
| He304   |                    |
| Infrared  |                    |
| K7699   |                    |
| LBHBand   |                    |
| Microwave   |                    |
| NaD   |                    |
| Ni6768  |                    |
| Optical   |                    |
| RadioFrequency  |                    |
| SoftXRays   |                    |
| Ultraviolet   |                    |
| WhiteLight  |                    |
| XRays   |                    |
| <b>Spectrogram</b>  | <b>Item</b>        |
| The characterization of signal strengths as a function of frequency (or energy) and time.   |                    |
| <b>Spectrometer</b>   | <b>Item</b>        |

An instrument that measures the component wavelengths of light (or other electromagnetic radiation) by splitting the light up into its component wavelengths.

**Spectrum** Item

The distribution of a characteristic of a physical system or phenomenon, such as the energy emitted by a radiant source, arranged in the order of wavelengths.

**Spherical** Item

A coordinate representation of a position vector or of a measured vector by its magnitude and two direction angles. The angles are relative to the base axes of the coordinate system used. Typically the angles are phi [azimuth angle,  $=\arctan(j/i)$ ] and theta, where theta may be a polar angle,  $\arctan\{[\text{SQRT}(i^2+j^2)]/k\}$ , or an elevation angle,  $\arctan[k/\text{SQRT}(i^2+j^2)]$ .

**StackPlot** Item

A representation of data showing multiple sets of observations on a single plot, possibly offsetting each plot by some uniform amount.

**StandardDeviation** 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.

**StartDate** DateTime

The specification of a starting point in time.

**StartLocation** Text

The initial position in space.

**Stoke's Parameters** Item

A set of four parameters (usually called I, Q, U and V) which describe the polarization state of an electromagnetic wave propagating through space.

**StopDate** DateTime

The specification of a stopping point in time.

**StopLocation** Text

The final position in space.

**Strahl** Item

A distribution of particles concentrated in a narrow energy band. The band may be aligned with a secondary feature. For example, it may occur in a narrow cone aligned with the mean magnetic field direction.

**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.

**StreamInteractionRegion** Item

The region (SIR) where two solar wind streams, typically having differing characteristics and solar sources, abut up against (and possibly partially interpenetrate) each other.

**Strong** Item

Highly likely given the available evidence. Considered in the range of 7-10 on a scale of 0-10.

**Structure** Container

The organization and relationship of individual values within a quantity.

Sub-elements:

Description  
Element  
Size

|   |                    |
|---|--------------------|
| <b>Substorm</b>   | <b>Item</b>        |
| A process by which plasma in the magnetotail becomes energized at a fast rate.  |                    |
| <b>Sun</b>  | <b>Enumeration</b> |
| The star upon which our solar system is centered.<br>Allowed Values:<br>Chromosphere<br>Corona<br>Interior<br>Photosphere<br>TransitionRegion   |                    |
| <b>Superhalo</b>  | <b>Item</b>        |
| The part of an object or distribution surrounding some central body or distribution evident in a second break in the distribution function (e.g., a different power law). It consists of a population at a higher energies than for a halo.   |                    |
| <b>Support</b>  | <b>Container</b>   |
| Information useful in understanding the context of an observation, typically observed or measured coincidentally with a physical observation.<br>Sub-elements:<br>Qualifier<br>SupportQuantity  |                    |
| <b>SupportQuantity</b>  | <b>Enumeration</b> |
| A characterization of the support information.<br>Allowed Values:<br>InstrumentMode<br>Other<br>Positional<br>Temporal<br>Velocity  |                    |
| <b>Surface</b>  | <b>Item</b>        |
| The outermost area of a solid object.   |                    |
| <b>Symmetric</b>  | <b>Item</b>        |
| Equal distribution about one or more axes.  |                    |
| <b>TAR</b>  | <b>Item</b>        |
| 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. |                    |
| <b>TIFF</b>   | <b>Item</b>        |
| A binary format for still pictures. Tagged Image Format File (TIFF). Originally developed by Aldus and now controlled by Adobe.   |                    |
| <b>TIIS</b>   | <b>Item</b>        |
| Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.  |                    |
| <b>TeamLeader</b>   | <b>Item</b>        |
| An individual who is the designated leader of an investigation.   |                    |
| <b>TeamMember</b>   | <b>Item</b>        |
| An individual who is a major participant in an investigation.   |                    |
| <b>TechnicalContact</b>   | <b>Item</b>        |
| An individual who can provide specific information with regard to the resource or supporting  |                    |

software

|                      |             |
|----------------------|-------------|
| <b>TechnicalNote</b> | <b>Item</b> |
|----------------------|-------------|

A document summarizing the performance and other technical characteristics of a product, machine, component, subsystem or software in sufficient detail to be used by an engineer or researcher.

|                    |             |
|--------------------|-------------|
| <b>Temperature</b> | <b>Item</b> |
|--------------------|-------------|

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).

|                 |             |
|-----------------|-------------|
| <b>Temporal</b> | <b>Item</b> |
|-----------------|-------------|

Pertaining to time.

|                            |                  |
|----------------------------|------------------|
| <b>TemporalDescription</b> | <b>Container</b> |
|----------------------------|------------------|

A characterization of the time over which the measurement was taken.

Sub-elements:

- Cadence
- CadenceMax
- CadenceMin
- Exposure
- ExposureMax
- ExposureMin
- TimeSpan

|               |             |
|---------------|-------------|
| <b>Tensor</b> | <b>Item</b> |
|---------------|-------------|

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.

|               |             |
|---------------|-------------|
| <b>Tethys</b> | <b>Item</b> |
|---------------|-------------|

The third largest moon of Saturn.

|             |                    |
|-------------|--------------------|
| <b>Text</b> | <b>Enumeration</b> |
|-------------|--------------------|

A sequence of characters which may have an imposed structure or organization.

Allowed Values:

- ASCII
- Unicode

|                      |             |
|----------------------|-------------|
| <b>ThermalPlasma</b> | <b>Item</b> |
|----------------------|-------------|

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.).

|                     |             |
|---------------------|-------------|
| <b>ThermalSpeed</b> | <b>Item</b> |
|---------------------|-------------|

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.

|                     |             |
|---------------------|-------------|
| <b>Thermosphere</b> | <b>Item</b> |
|---------------------|-------------|

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

|                  |             |
|------------------|-------------|
| <b>Thumbnail</b> | <b>Item</b> |
|------------------|-------------|

A small representation of an image which is suitable to infer what the full-sized imaged is like.

|                     |             |
|---------------------|-------------|
| <b>TimeOfFlight</b> | <b>Item</b> |
|---------------------|-------------|

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

|                   |             |
|-------------------|-------------|
| <b>TimeSeries</b> | <b>Item</b> |
|-------------------|-------------|

A representation of data showing a set of observations taken at different points in time and

charted as a time series.

|  |           |
|--|-----------|
| <b>TimeSpan</b>  | Container |
| The duration of an interval in time.<br>Sub-elements:<br>Note<br>RelativeStopDate<br>StartDate<br>StopDate   |           |
| <b>Titan</b>   | Item      |
| The largest moon of Saturn and the second-largest moon in the Solar System,  |           |
| <b>Titania</b>   | Item      |
| The largest moon of Uranus and the eighth largest moon in the Solar System.  |           |
| <b>Topside</b>   | Item      |
| The region at the upper most areas of the ionosphere.  |           |
| <b>Total</b>   | Item      |
| The summation of quantities over all possible species.   |           |
| <b>TotalPressure</b>   | Item      |
| In an MHD fluid it is the number density (N) times Boltzmann constant times the temperature in Kelvin.   |           |
| <b>Trace</b>   | Item      |
| The sum of the elements on the main diagonal (the diagonal from the upper left to the lower right) of a square matrix.   |           |
| <b>TransitionRegion</b>  | 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.   |           |
| <b>Triton</b>  | Item      |
| The largest moon of Neptune.   |           |
| <b>Troposphere</b>   | 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.   |           |
| <b>UCD</b>   | Text      |
| The nature of a physical parameter expressed using the IVOA UCD1+ controlled vocabulary.   |           |
| <b>UDF</b>   | Item      |
| Universal Data Format (UDF). The Optical Technology Storage Association's Universal Disk Format, based on ISO 13346. See < <a href="http://www.osta.org/specs/index.htm">http://www.osta.org/specs/index.htm</a> >   |           |
| <b>URL</b>   | 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. |           |
| <b>Ultraviolet</b>   | Item      |
| Photons with a wavelength range: 10 to 400 nm.   |           |

|   |             |
|---|-------------|
| <b>Umbriel</b>  | Item        |
| The third largest and fourth most massive moon of Uranus.   |             |
| <b>Uncalibrated</b>   | 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.  |             |
| <b>Uncertainty</b>  | Item        |
| A statistically defined discrepancy between a measured quantity and the true value of that quantity that cannot be corrected by calculation or calibration.   |             |
| <b>Unicode</b>  | Item        |
| Text in multi-byte Unicode format.  |             |
| <b>Units</b>  | 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 <a href="http://www.bipm.fr/">http://www.bipm.fr/</a> ) 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: <a href="http://www.bipm.fr/en/si/si_brochure/chapter2/2-1/#symbols">http://www.bipm.fr/en/si/si_brochure/chapter2/2-1/#symbols</a> and those for common derived units can be found at: <a href="http://www.bipm.fr/en/si/derived_units/2-2-2.html">http://www.bipm.fr/en/si/derived_units/2-2-2.html</a> |             |
| <b>UnitsConversion</b>  | 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-9>T" which converts the units, presumable nT, to Tesla. Another example is: "1.0e+3>m/s" which converts a velocity expressed in kilometers per second to meters per second.  |             |
| <b>Unlikely</b>   | Item        |
| Not likely given the available evidence. Considered in the range of 0 on a scale of 0-10.   |             |
| <b>Unspecified</b>  | Item        |
| A value which is not provided.  |             |
| <b>Uranus</b>   | Enumeration |
| The eighth planet from the sun in our solar system.   |             |
| <b>VCrossB</b>  | Item        |
| The cross product of the charge velocity (V) and the magnetic field (B). It is the electric field exerted on a point charge by a magnetic field.  |             |
| <b>VOTable</b>  | Item        |
| A proposed IVOA standard designed as a flexible storage and exchange format for tabular data.   |             |
| <b>VSO</b>  | Item        |
| Venus Solar Orbital - A coordinate system related to Venus where X is anti-sunward, Y along the orbital velocity direction.   |             |
| <b>ValidMax</b>   | Text        |
| The largest legitimate value.   |             |

|  |             |
|--|-------------|
| <b>ValidMin</b>  | Text        |
| The smallest legitimate value.   |             |
| <b>ValueFormat</b>   | Text        |
| A string defining the output format used when extracting data values out to a file or screen. The magnitude and the number of significant figures needed should be carefully considered. The output format string can be in either Fortran or C syntax.  |             |
| <b>Variance</b>  | 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.  |             |
| <b>Vector</b>  | 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;).   |             |
| <b>Velocity</b>  | Item        |
| Rate of change of position. Also used for the average velocity of a collection of particles, also referred to as "bulk velocity".  |             |
| <b>Venus</b>   | Enumeration |
| The second planet from the sun in our solar system.  |             |
| <b>Version</b>   | 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). |             |
| <b>Vertical</b>  | Item        |
| Perpendicular to the plane of the horizon or a base line.  |             |
| <b>WGS84</b>   | 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.  |             |
| <b>Wave</b>  | Container   |
| Periodic or quasi-periodic (AC) variations of physical quantities in time and space, capable of propagating or being trapped within particular regimes.<br>Sub-elements:<br>EnergyRange<br>FrequencyRange<br>Qualifier<br>WaveQuantity<br>WaveType<br>WavelengthRange  |             |
| <b>WaveForm</b>  | Item        |
| Spatial or temporal variations of wave amplitude over wave-period timescales.  |             |
| <b>WaveQuantity</b>  | Enumeration |
| A characterization of the physical properties of a wave.<br>Allowed Values:<br>ACElectricField<br>ACMagneticField<br>Absorption  |             |

Albedo  
 DopplerFrequency  
 Emissivity  
 EnergyFlux  
 EquivalentWidth  
 Frequency  
 Gyrofrequency  
 Intensity  
 LineDepth  
 MagneticField  
 ModeAmplitude  
 PlasmaFrequency  
 Polarization  
 PoyntingFlux  
 PropagationTime  
 StokesParameters  
 Velocity  
 Wavelength

|                 |                    |
|-----------------|--------------------|
| <b>WaveType</b> | <b>Enumeration</b> |
|-----------------|--------------------|

A characterization of the carrier or phenomenon of wave information observed by the measurement.

Allowed Values:

Electromagnetic  
 Electrostatic  
 Hydrodynamic  
 MHD  
 Photon  
 PlasmaWaves

|                         |             |
|-------------------------|-------------|
| <b>WaveformReceiver</b> | <b>Item</b> |
|-------------------------|-------------|

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

|                   |             |
|-------------------|-------------|
| <b>Wavelength</b> | <b>Item</b> |
|-------------------|-------------|

The peak-to-peak distance over one wave period.

|                        |                  |
|------------------------|------------------|
| <b>WavelengthRange</b> | <b>Container</b> |
|------------------------|------------------|

The range of possible values for the observed wavelength.

Sub-elements:

Bin  
 High  
 Low  
 SpectralRange  
 Units

|              |                    |
|--------------|--------------------|
| <b>Waves</b> | <b>Enumeration</b> |
|--------------|--------------------|

Data resulting from observations of wave experiments and natural wave phenomena. Wave experiments are typically active and natural wave phenomena are passive. Examples of wave experiments include coherent/incoherent scatter radars, radio soundings, VLF propagation studies, ionospheric scintillation of beacon satellite signals, etc. Examples of natural wave phenomena include micropulsations, mesospheric gravity waves, auroral/plasmaspheric hiss, Langmuir waves, AKR, Jovian decametric radiation, solar radio bursts, etc.

Allowed Values:

Active  
 Passive

|             |             |
|-------------|-------------|
| <b>Weak</b> | <b>Item</b> |
|-------------|-------------|

Slightly likely given the available evidence. Considered in the range of 1-4 on a scale of 0-10.

|                   |             |
|-------------------|-------------|
| <b>WhiteLight</b> | <b>Item</b> |
|-------------------|-------------|

Photons with a wavelength in the visible range for humans.



|  |             |
|--|-------------|
| <b>WhitePaper</b>  | <b>Item</b> |
| An authoritative report giving information or proposals on an issue.   |             |
| <b>XML</b>   | <b>Item</b> |
| eXtensible Mark-up Language (XML). A structured format for representing information. See <a href="http://www.w3.org/XML/">http://www.w3.org/XML/</a> |             |
| <b>XRays</b>   | <b>Item</b> |
| Photons with a wavelength range: $0.001 \leq x < 10$ nm  |             |
| <b>ZIP</b>   | <b>Item</b> |
| 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.

### AccessRights List Closed

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.   |
| PartiallyRestricted | Some portions of the resource have restricted access, the rest is open access. Typically this is for accumulating data collections where some data is under review before being publicly released. |
| Restricted          | Access to the product is regulated and requires some form of identification.   |

### AnnotationType List Closed

Identifiers for an classification of an annotation.

| Term    | Definition   |
|---------|--|
| Anomaly | An interval where measurements or observations may be adversely affected.                              |
| Event   | An action or observation which occurs at a point in time.  |
| Feature | A prominent or distinctive characteristic that occurs at a location or persists over a period of time. |

### AssociationType List Closed

Identifiers for resource associations.

| Term         | Definition  |
|--------------|---|
| ChildEventOf | A descendant or caused by another resource.   |
| DerivedFrom  | A transformed or altered version of a resource instance.  |
| ObservedBy   | Detected or originating from another resource.  |
| Other        | Not classified with more specific terms. The context of its usage may be described in related text. |
| PartOf       | A portion of a larger resource.   |
| RevisionOf   | A modified version of a resource instance.  |

### Availability List Closed

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 on-line status in response to a given request. |
| Online  | Directly accessible electronically.  |

### ClassificationMethod List Closed

Identifiers for the technique used to determine the characteristics of an object.

| Term       | Definition   |
|------------|--|
| Automatic  | Determined by the analysis or assessment performed by a program or server. |
| Inferred   | Determined by the analysis of other information or resources.              |
| Inspection | Determined by the analysis or assessment performed by a person.            |

#### Component List Closed

Identifiers for the axis of coordinate systems.

| Term | Definition   |
|------|--|
| I    | Projection of a vector along the first named axis of a coordinate system. Typically the X axis, but could be the R axis for an RTN coordinate system.  |
| J    | Projection of a vector along the second named axis of a coordinate system. Typically the Y axis, but could be the T axis for an RTN coordinate system. |
| K    | Projection of a vector along the third named axis of a coordinate system. Typically the Z axis, but could be the N axis for an RTN coordinate system.  |

#### ConfidenceRating List Closed

Identifiers for the classification of the certainty of an assertion.

| Term     | Definition   |
|----------|--|
| Probable | Likely given the available evidence. Considered in the range of 4-7 on a scale of 0-10.          |
| Strong   | Highly likely given the available evidence. Considered in the range of 7-10 on a scale of 0-10.  |
| Unlikely | Not likely given the available evidence. Considered in the range of 0 on a scale of 0-10.        |
| Weak     | Slightly likely given the available evidence. Considered in the range of 1-4 on a scale of 0-10. |

#### CoordinateRepresentation List Closed

Identifiers of the method or form for specifying a given point or vector in a given coordinate system.

| Term        | Definition   |
|-------------|--|
| Cartesian   | A representation in which a position vector or a measured vector (e.g., field or flow) is specified by its components along the base axes of the coordinate system.  |
| Cylindrical | A coordinate representation of a position vector or measured vector (field or flow) by its k-component, the magnitude of its projection into the i-j plane, and the azimuthal angle of the i-j plane projection.         |
| Spherical   | A coordinate representation of a position vector or of a measured vector by its magnitude and two direction angles. The angles are relative to the base axes of the coordinate system used. Typically the angles are phi |

[azimuth angle, =arctan (j/i)] and theta, where theta may be a polar angle, arctan {[SQRT(i^2+j^2)]/k}, or an elevation angle, arctan [k/SQRT (i^2+j^2)].

| CoordinateSystemName List | Closed |
|---------------------------|--------|
|---------------------------|--------|

Identifiers of the origin and orientation of a set of typically orthogonal axes.

| 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 <a href="http://nssdc.gsfc.nasa.gov/space/cgm/cgmm_des.html">http://nssdc.gsfc.nasa.gov/space/cgm/cgmm_des.html</a> |
| CSO        | Corrected Solar Orbital - A coordinate system related to Earth where X is anti-sunward, Y along the orbital velocity direction.  |
| Carrington | A coordinate system which is centered at the Sun and is "fixed" with respect 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 <a href="http://cdpp.cnes.fr/00428.pdf">http://cdpp.cnes.fr/00428.pdf</a>   |
| ECEF       | The Earth-Centered, Earth-Fixed (ECEF) coordinate system has point (0,0,0) defined as the center of mass of the Earth. Its axes are aligned with the International Reference Pole (IRP) and International Reference Meridian (IRM). The x-axis intersects the sphere of the Earth at 0 degree latitude (Equator) and 0 degree longitude (Greenwich). The z-axis points north. The y-axis completes the right handed coordinate system.   |
| ENP        | ENP (also called PEN) - The P vector component points northward, perpendicular to orbit plane which for a zero degree inclination orbit is parallel to Earth's spin axis. The E vector component is perpendicular to P and N and points earthward. The N component is perpendicular to P and E and is positive eastward.   |
| GEI        | 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. When the X axis is the direction of the mean vernal equinox of J2000, the coordinate system is also called GCI. Then the Z axis is also defined as being normal to the mean Earth equator of J2000.

|       |  |
|-------|--|
| 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.  |
| GPHIO | Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.   |
| 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.  |
| HCC   | Heliocentric Cartesian - A 3-D orthonormal coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points toward the observer. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Standard representation for this system is via the point's x and y values, expressed either as physical distances or as fractions of the solar disk radius.  |
| HCI   | Heliographic Carrington Inertial.  |
| HCR   | Heliocentric Radial - A 3-D orthonormal coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points toward the observer. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Standard representation for this system is via the point's distance rho from the Z axis [ $\text{Rho} = \text{SQRT}(x^{**2} + y^{**2})$ ] and its phase angle psi measured counterclockwise from the +Y axis [ $\text{psi} = \text{arctan}(-y/x)$ ] |
| 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.   |
| HERTN | Helio-Ecliptic Radial Tangential Normal coordinate system. Typically centered at a spacecraft. The X axis (radial) is set as the primary axis, and is defined as the axis pointing from the spacecraft to the Sun. The Z axis (tangential) is set as the secondary axis, and is defined as that portion of the ecliptic rotational axis which is perpendicular to the primary axis. The Y axis (Normal) is defined as $Z \text{ cross } X$ .   |
| 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  |
| HGI   | <a href="http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html">http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html</a><br>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  |
| HGRTN | <a href="http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html">http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html</a><br>Heliocentric Radial Tangential Normal coordinate system (aka RTN). Typically centered at a spacecraft. Used for IMF and plasma V vectors. The X axis (radial) is set as the primary axis, and is defined as the axis pointing from the spacecraft to the Sun. The Z axis (tangential) is set as the secondary axis, and is defined as that portion of the solar North rotational axis which is perpendicular to the primary axis. The Y axis (normal) is defined as $Z \text{ cross } X$ .                    |
| HPC   | Helioprojective Cartesian = A 3-D orthonormal (left-handed) coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points from the observer to the center of the solar disk. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Given as the distance between the observer and the center of the solar disk, the standard representation of an (x,y) point on the solar disk is via the point's longitude angle [ $\arctan(x/d)$ ] and latitude angle |

|       |  |
|-------|--|
|       | [arctan y/d].  |
| HPR   | Helioprojective Radial - A 3-D orthonormal (left-handed) coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points from the observer to the center of the solar disk. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Given as the distance between the observer and the center of the solar disk, the standard representation for this system of an (x,y) point on the solar disk is via the point's latitude angle $\theta = \arctan [\text{SQRT}(x^2 + y^2)/d]$ or equivalent declination parameter $\delta = \theta - 90 \text{ deg}$ , and its phase angle $\psi$ as measured counter-clockwise from the +Y axis [ $\psi = \arctan (-y/x)$ ]. |
| HSM   | Heliospheric 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.   |
| 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.  |
| JSM   | Jovian Solar Magnetospheric - A coordinate system related to Jupiter where the X axis is from Jupiter to Sun, Z axis is northward in a plane containing the X axis and the Jovian dipole axis.   |
| JSO   | Jovian Solar Orbital - A coordinate system related to Jupiter where X anti-sunward, Y along the orbital velocity direction.  |
| KSM   | Kronian Solar Magnetospheric - A coordinate system related to Saturn where the X axis is anti-sunward, Z axis is northward in a plane containing the X axis and the Kronian dipole axis.   |
| KSO   | Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.   |
| 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) = $\text{SQRT}(B_x^2 + B_y^2)$ and D (declination angle) = $\arctan(B_y/B_x)$  |
| 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 $Y = N \times Z$ , $X = Y \times Z$ . See Russell, 1971, and <a href="http://cdpp.cnes.fr/00428.pdf">http://cdpp.cnes.fr/00428.pdf</a>  |

|                      |   |
|----------------------|---|
| 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 < <a href="http://cdpp.cnes.fr/00428.pdf">http://cdpp.cnes.fr/00428.pdf</a> >   |
| MSO                  | Mars/Mercury Solar Orbital A coordinate system related to Mars or Mercury. A coordinate system where, depending on the body (Mars or Mercury), X is anti-sunward, Y along the orbital velocity direction.   |
| RTN                  | Radial Tangential Normal. Typically centered at a spacecraft. Used for IMF and plasma V vectors. The X axis (radial) is set as the primary axis, and is defined as the axis pointing from the spacecraft to the Sun. The Z axis (tangential) is set as the secondary axis, and is defined as that portion of the solar North rotational axis which is perpendicular to the primary axis. The Y axis (normal) is defined as Z cross X. |
| 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 < <a href="http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html">http://nssdc.gsfc.nasa.gov/space/helios/coord_des.html</a> >   |
| 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 < <a href="http://cdpp.cnes.fr/00428.pdf">http://cdpp.cnes.fr/00428.pdf</a> >  |
| 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 < <a href="http://cdpp.cnes.fr/00428.pdf">http://cdpp.cnes.fr/00428.pdf</a> >  |
| 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.   |
| SSE_L                | Selenocentric Solar Ecliptic. The X axis points from the center of the Earth's moon to the sun, the Z axis is normal to the ecliptic plane, positive northward. And the Y axis completes the right-handed set of axes.  |
| SpacecraftOrbitPlane | A coordinate system where X lies in the plane normal to and in the direction of motion of the spacecraft, Z is  |



|       |   |
|-------|---|
|       | normal to this plane and Y completes the triad in a right-handed coordinate system.   |
| TIIS  | Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.  |
| VSO   | Venus Solar Orbital - A coordinate system related to Venus where X is anti-sunward, Y along the orbital velocity direction.   |
| 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. |

**DirectionAngle List**

Closed

Identifiers for the angle between a vector and a base axis.

| Term           | Definition   |
|----------------|--|
| AzimuthAngle   | The angle between the projection into the i-j plane of a position or measured vector and the i-axis of the coordinate system. Mathematically defined as $\arctan(j/i)$ . This term could be also applied to angles measured in different planes, for example the IMF clock angle defined as $\arctan( By /Bz)$ . |
| ElevationAngle | The angle between the position or measured vector and the i-j plane of the coordinate system. Mathematically defined as $\arctan(k/\sqrt{i^2+j^2})$ .  |
| PolarAngle     | The angle between the position or measured vector and the k-axis of the coordinate system. Mathematically defined as $\arctan([\sqrt{i^2+j^2}]/k)$ . This term could be also applied to angles between the vector and other components, for example the IMF cone angle defined as $\arccos(Bx/Bt)$ .             |

**DisplayType List**

Closed

Identifiers for types or classes of rendered data.

| Term        | Definition  |
|-------------|---|
| Image       | A two-dimensional representation of data with values at each element of the array related to an intensity or a color.   |
| Plasmagram  | The characterization of signal strengths in active sounding measurements as a function of virtual range or signal delay time and sounding frequency. A Plasmagram is also referred to as an Ionogram. |
| Spectrogram | The characterization of signal strengths as a function of frequency (or energy) and time.   |
| StackPlot   | A representation of data showing multiple sets of observations on a single plot, possibly offsetting each plot by some uniform amount.  |
| TimeSeries  | A representation of data showing a set of observations taken at different points in time and charted as a time series.  |

WaveForm Spatial or temporal variations of wave amplitude over wave-period timescales.

#### DocumentType List Closed

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

| Term          | Definition   |
|---------------|--|
| Other         | Not classified with more specific terms. The context of its usage may be described in related text.  |
| Poster        | A set of information arranged on a single page or sheet, typically in a large format.  |
| Presentation  | A set of information that is used when communicating to an audience.   |
| Report        | A document which describes the findings of some individual or group.   |
| Specification | A detailed description of the requirements and other aspects of an object or component that may be used to develop an implementation.  |
| TechnicalNote | A document summarizing the performance and other technical characteristics of a product, machine, component, subsystem or software in sufficient detail to be used by an engineer or researcher. |
| WhitePaper    | An authoritative report giving information or proposals on an issue.   |

#### 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. |
| Moon          | The only natural satellite of the Earth.   |
| NearSurface   | 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

Identifiers 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 < <a href="http://www.bzip.org/">http://www.bzip.org/</a> > |
| 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 <a href="http://www.gnu.org/software/gzip/gzip.html">http://www.gnu.org/software/gzip/gzip.html</a> or <a href="http://www.gzip.org/">http://www.gzip.org/</a>  |
| None      | A lack or absence of anything.  |
| S3_BUCKET | A container of objects that comply with the Amazon Simple Storage Service (S3) specifications. A bucket has a unique, user-assigned key (name). A bucket can contain any number of objects with an aggregate size of 5 gigabytes. A bucket may be accompanied by up to 2 kilobytes of metadata. |
| 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.   |

|                    |        |
|--------------------|--------|
| FieldQuantity 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 | Electric and magnetic field variations in time and space that propagate through a medium or a vacuum with the wave's propagation, electric field, and magnetic field vectors forming an orthogonal triad. Waves in this category are detected by having their field quantities measured. |
| Gyrofrequency   | The number of gyrations around a magnetic guiding center (field line) a charged particle makes per unit time due to the Lorentz force.   |
| Magnetic        | The physical attribute attributed to a magnet or its equivalent.   |
| PlasmaFrequency | A number-density-dependent characteristic frequency of a plasma.   |
| Potential       | The work required per unit charge to move a charge from a reference point to a point at infinity (electric potential is defined to be zero). The electric potential of a spacecraft is often referred to as the "spacecraft potential". The  |

|              |   |
|--------------|---|
| PoyntingFlux | <p>spacecraft potential is the electric potential of the spacecraft relative to the potential of the nearby plasma. The spacecraft potential is non-zero because the spacecraft charges to the level that the emitted photoelectron flux going to infinity is balanced by the plasma electron flux to the spacecraft.</p> <p>Electromagnetic energy flux transported by a wave characterized as the rate of energy transport per unit area per steradian.</p> |
|--------------|---|

**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.  |
| CEF1   | 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.  |
| CEF2   | 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.               |
| CSV    | Comma Separated Value - A data exchange format defined by RFC 4180.  |
| Excel  | A Microsoft spreadsheet format used to hold a variety of data in tables which can include calculations.  |
| 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   |
| HDF4   | Hierarchical Data Format, Version 4  |
| HDF5   | Hierarchical Data Format, Version 5  |
| HTML   | A text file containing structured information represented in the HyperText Mark-up Language (HTML). See  |

|            |  |
|------------|--|
|            | < <a href="http://www.w3.org/MarkUp/">http://www.w3.org/MarkUp/</a> >  |
| Hardcopy   | A permanent reproduction, or copy in the form of a physical object, of any media suitable for direct use by a person.  |
| 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).  |
| IDL        | Interactive Data Language (IDL) save set. IDL is a proprietary format.   |
| JPEG       | A binary format for still images defined by the Joint Photographic Experts Group   |
| JSON       | Javascript Object Notation - A lightweight data-interchange format.  |
| MATLAB_4   | MATLAB Workspace save set, version 4. MAT-files are double-precision, binary, MATLAB format files.   |
| MATLAB_6   | MATLAB is a proprietary product of The MathWorks. MATLAB Workspace save set, version 6. MAT-files are double-precision, binary, MATLAB format files.   |
| MATLAB_7   | MATLAB is a proprietary product of The MathWorks. MATLAB Workspace save set, version 7. MAT-files are double-precision, binary, MATLAB format files. Version 7 includes data compression and Unicode encoding.   |
| MPEG       | MATLAB is a proprietary product of The MathWorks. 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 portable data format for array-oriented data access. See < <a href="http://my.unidata.ucar.edu/content/software/netcdf/">http://my.unidata.ucar.edu/content/software/netcdf/</a> >                                       |
| 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 < <a href="http://developer.apple.com/quicktime/">http://developer.apple.com/quicktime/</a> >   |
| TIFF       | A binary format for still pictures. Tagged Image Format File (TIFF). Originally developed by Aldus and now controlled by Adobe.  |
| Text       | A sequence of characters which may have an imposed structure or organization.  |
| UDF        | Universal Data Format (UDF). The Optical Technology  |

|         |   |
|---------|---|
| VOTable | Storage Association's Universal Disk Format, based on ISO 13346. See < <a href="http://www.osta.org/specs/index.htm">http://www.osta.org/specs/index.htm</a> >  |
| XML     | A proposed IVOA standard designed as a flexible storage and exchange format for tabular data.<br>eXtensible Mark-up Language (XML). A structured format for representing information. See < <a href="http://www.w3.org/XML/">http://www.w3.org/XML/</a> > |

**Hardcopy List**

Closed

Identifiers for permanent reproductions, or copy in the form of a physical object, of any media suitable for direct use by a person.

| Term              | Definition   |
|-------------------|--|
| Film              | An image recording medium on which usually a "negative" analog image is registered. A "positive" image can be recovered or reproduced from film, which is usually made of flexible materials for ease of storage and transportation.       |
| Microfiche        | A sheet of microfilm on which many pages of material have been photographed; a magnification system is used to read the material.  |
| Microfilm         | Film rolls on which materials are photographed at greatly reduced size; a magnification system is used to read the material.   |
| Photograph        | An image (positive or negative) registered on a piece of photo-sensitive paper   |
| PhotographicPlate | A rigid (typically glass) medium that functions like film. Its rigidity is for guarding against image distortion due to medium deformation (caused by heat and humidity). Photographic plates are often used for astronomical photography. |
| Print             | A sheet of any written or printed material which may include notes or graphics. Multiple printed pages may be bound into a manuscript or book.   |

**HashFunction 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   |
|-------------|--|
| Heliosheath | The region extending radially outward from the heliospheric termination shock and in which the decelerated solar wind plasma is still significant. |
| Inner       | The region of the heliosphere extending radially outward from the solar coronal base to just inside 1 AU.  |
| NearEarth   | 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 extending radially outward from just outside 1 AU to the heliospheric termination shock.                             |
| Remote1AU   | A roughly toroidal region that includes the Earth's orbit, but exclusive of the region near the Earth.   |

#### InstrumentType 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.  |
| Coronagraph                 | 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 celestial objects.   |
| DoubleSphere                | 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.  |
| DustDetector                | An instrument which determines the mass and speed of ambient dust particles.   |
| ElectronDriftInstrument     | 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.  |
| ElectrostaticAnalyser       | An instrument which uses charged plates to analyze the mass, charge and kinetic energies of charged particles which enter the instrument.  |
| EnergeticParticleInstrument | An instrument that measures fluxes of charged particles as a function of time, direction of motion, mass, charge and/or species.   |
| FaradayCup                  | 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. |

|                              |  |
|------------------------------|--|
| FluxFeedback                 | 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.  |
| FourierTransformSpectrograph | An instrument that determines the spectra of a radiative source, using time-domain measurements and a Fourier transform.   |
| Imager                       | An instrument which samples the radiation from an area at one or more spectral ranges emitted or reflected by an object.   |
| ImagingSpectrometer          | 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 to study the properties of two or more waves from the pattern of interference created by their superposition.  |
| IonChamber                   | A device in which the collected electrical charge from ionization in a gas-filled cavity is taken to be the proportion to some parameter (e.g. dose or exposure) of radiation field  |
| IonDrift                     | A device which measures the current produced by the displacement of ambient ions on a grid, thereby allowing the determination of the ion trajectory and velocity.   |
| LangmuirProbe                | 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.   |
| LongWire                     | 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.   |
| Magnetograph                 | A special type of magnetometer that records a time plot of the local magnetic field near the instrument; or a telescope capable of determining the magnetic field strength and/or direction on a distant object such as the Sun, using the Zeeman splitting or other spectral signatures of magnetization. |
| Magnetometer                 | An instrument which measures the ambient magnetic field.   |
| MassSpectrometer             | An instrument which distinguishes chemical species in terms of their different isotopic masses.  |
| MicrochannelPlate            | An instrument used for the detection of elementary particles, ions, ultraviolet rays and soft X-rays constructed from very thin conductive glass capillaries.  |
| MultispectralImager          | An instrument which captures images at multiple spectral ranges.   |
| NeutralAtomImager            | An instrument which measures the quantity and properties of neutral particles over a range of angles. Measured properties can include mass and energy.   |
| NeutralParticleDetector      | An instrument which measures the quantity and  |



|                            |  |
|----------------------------|--|
|                            | properties of neutral particles. Measured properties can include mass and plasma bulk densities.   |
| ParticleCorrelator         | An instrument which correlates particle flux to help identify wave/particle interactions.  |
| ParticleDetector           | An instrument which detects particle flux!!!   |
| Photometer                 | An instrument which measures the strength of electromagnetic radiation within a spectral band which can range from ultraviolet to infrared and includes the visible spectrum.  |
| PhotomultiplierTube        | A vacuum phototube that is an extremely sensitive detector of light in the ultraviolet, visible, and near-infrared ranges of the electromagnetic spectrum.   |
| Photopolarimeter           | An instrument which measures the intensity and polarization or radiant energy. A photopolarimeter is a combination of a photometer and a polarimeter.  |
| Platform                   | A collection of components which can be positioned and oriented as a single unit. A platform may contain other platforms. For example, a spacecraft is a platform which may have components that can be articulated and are also considered platforms.   |
| ProportionalCounter        | An instrument which measures energy of ionization radiation based on interactions with a gas.  |
| QuadrisphericalAnalyser    | 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.   |
| ResonanceSounder           | 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. |
| RetardingPotentialAnalyser | An instrument which measures ion temperatures and ion concentrations using a planar ion trap.  |
| Riometer                   | An instrument which measure the signal strength in various directions of the galactic radio signals. Variations in these signals are influenced by solar flare activity and geomagnetic storm and substorm processes.  |
| ScintillationDetector      | An instrument which detects flouresences of a material which is excited by high energy (ionizing) electromagnetic or charged particle radiation.   |
| SearchCoil                 | 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.  |
| SolidStateDetector         | A detector of the charge carriers (electrons and holes)  |

|                            |   |
|----------------------------|---|
|                            | generated in semiconductors by energy deposited by gamma ray photons. Also known as a "semiconductor detector".   |
| Sounder                    | An instrument which measures the radiances from an object. A sounder may measure radiances at multiple spectral ranges.                                       |
| SpacecraftPotentialControl | An instrument to control the electric potential of a spacecraft with respect to the ambient plasma by emitting a variable current of positive ions.           |
| SpectralPowerReceiver      | 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) by splitting the light up into its component wavelengths. |
| TimeOfFlight               | An instrument which measures the time it takes for a particle to travel between two detectors.  |
| Unspecified                | A value which is not provided.  |
| WaveformReceiver           | A radio receiver which outputs the value of one or more components of the electric and/or magnetic field as a function of time.                               |

|                      |        |
|----------------------|--------|
| <b>Integral List</b> | Closed |
|----------------------|--------|

Identifiers for values above a given threshold and over area or solid-angle range.

| Term       | Definition  |
|------------|---|
| Area       | Integration over the extent of a planar region, or of the surface of a solid.             |
| Bandwidth  | Integration over the width a frequency band.  |
| SolidAngle | Integration over the angle in three-dimensional space that an object subtends at a point. |

|                        |        |
|------------------------|--------|
| <b>Ionosphere List</b> | Closed |
|------------------------|--------|

Identifiers for ionospheric regions.

| Term    | Definition  |
|---------|---|
| DRegion | 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.  |
| ERegion | 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.   |
| FRegion | 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. |
| Topside | The region at the upper most areas of the ionosphere.   |

|                           |        |
|---------------------------|--------|
| <b>Magnetosphere List</b> | 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 field is stretched backwards by the force of the solar wind. For Earth, the magnetotail begins at a night-side radial distance of $10 R_e$ ( $X > -10R_e$ ). |
| 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 auroral zone.  |
| RadiationBelt | The region within a magnetosphere where high-energy particles could potentially be trapped in a magnetic field.  |

#### MeasurementType List

Closed

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

| Term               | Definition   |
|--------------------|--|
| ActivityIndex      | 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.                                |
| Dopplergram        | A map or image depicting the spatial distribution of line-of-sight velocities of the observed object.  |
| Dust               | Free microscopic particles of solid material.  |
| ElectricField      | A region of space around a charged particle, or between two voltages within which a force is exerted on charged objects in its vicinity. An electric field is the electric force per unit charge.        |
| EnergeticParticles | 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.                                      |
| ImageIntensity     | 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. |
| InstrumentStatus   | A quantity directly related to the operation or function of an instrument.   |
| IonComposition     | 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         | 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. Irradiance data may be reported in any units (i.e. counts/s) due to, for example, being at a particular wavelength, or to being a not-fully-calibrated relative measurement.   |
| MagneticField     | 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.")  |
| NeutralAtomImages | 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-of-sight trajectory.  |
| NeutralGas        | 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 describes 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.  |
| Spectrum          | The distribution of a characteristic of a physical system or phenomenon, such as the energy emitted by a radiant source, arranged in the order of wavelengths.  |
| ThermalPlasma     | 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.).   |
| Waves             | Data resulting from observations of wave experiments and natural wave phenomena. Wave experiments are typically active and natural wave phenomena are passive. Examples of wave experiments include coherent/incoherent scatter radars, radio soundings, VLF propagation studies, ionospheric scintillation of beacon satellite signals, etc. Examples of natural wave phenomena include micropulsations, mesospheric gravity waves, auroral/plasmaspheric hiss, Langmuir waves, AKR, Jovian decametric radiation, solar radio bursts, etc. |

**MixedQuantity List**

Closed

Identifiers for the combined attributes of a mixed parameter quantity.

| Term           | Definition   |
|----------------|--|
| AkasofuEpsilon | A measure of the magnetopause energy flux and an indicator of the solar wind power available for subsequent magnetospheric energization. Defined as: $V*B^2*l^2\sin(\theta/2)^4$ where B is the IMF, l is an |

|                               |  |
|-------------------------------|--|
|                               | empirical scaling parameter equal to 7 RE, and $\theta = \tan(B_Y / B_Z)^{-1}$ the IMF clock angle.  |
| AlfvenMachNumber              | The ratio of the bulk flow speed to the Alfven speed.  |
| AlfvenVelocity                | Phase velocity of the Alfven wave; In SI units it is the velocity of the magnetic field divided by the square root of the mass density times the permeability of free space ( $\mu$ ). |
| FrequencyToGyrofrequencyRatio | The ratio of the characteristic frequency of a medium to gyrofrequency of a particle.  |
| IMFClockAngle                 | The clockwise angle of the direction of interplanetary magnetic field (IMF) measured in the plane of the body pole perpendicular to the line between the body and the Sun.             |
| MagnetosonicMachNumber        | The ratio of the velocity of fast mode waves to the Alfven velocity.   |
| Other                         | Not classified with more specific terms. The context of its usage may be described in related text.  |
| PlasmaBeta                    | The ratio of the plasma pressure ( $nkT$ ) to the magnetic pressure ( $B^2/2\mu_0$ ) of the $SUM(nkT)/(B^2/2\mu_0)$ .  |
| SolarUVFlux                   | The amount of Ultraviolet energy originating from the Sun passing through a unit area in a unit time.  |
| TotalPressure                 | In an MHD fluid it is the number density ( $N$ ) times Boltzmann constant times the temperature in Kelvin.   |
| VCrossB                       | The cross product of the charge velocity ( $V$ ) and the magnetic field ( $B$ ). It is the electric field exerted on a point charge by a magnetic field.                               |

#### NearSurface 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.   |
| AuroralRegion    | The region in the atmosphere where electrically-charged particles bombarding the upper atmosphere of a planet in the presence of a magnetic field produce an optical phenomenon. |
| EquatorialRegion | 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                 |

|                            |  |
|----------------------------|--|
|                            | plasmaopause, which is defined by an order of magnitude drop in plasma density.  |
| PolarCap                   | The areas of the globe surrounding the poles and consisting of the region north of 60 degrees north latitude and the region south of 60 degrees south latitude.  |
| SouthAtlanticAnomalyRegion | The region where the 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.                             |

#### ParticleQuantity List

Closed

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

| Term                 | Definition   |
|----------------------|--|
| ArrivalDirection     | An angular measure of the direction from which an energetic particle or photon was incident on a detector. The angles may be measured in any coordinate system.  |
| AtomicNumberDetected | The number of protons in the nucleus of an atom as determined by a detector.   |
| AverageChargeState   | A measure of the composite deficit (positive) or excess (negative) of electrons with respect to protons.   |
| ChargeState          | Charge of a fully or partially stripped ion, in units of the charge of a proton. Charge state of a bare proton = 1.  |
| CountRate            | The number of events per unit time.  |
| Counts               | The number of detection events occurring in a detector over the detector accumulation time.  |
| 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)   |
| EnergyDensity        | The amount of energy per unit volume.  |
| EnergyFlux           | The amount of energy passing through a unit area in a unit time.   |
| Entropy              | A function of thermodynamic quantity, such as temperature, pressure, or composition, that is a measure of the energy that is not available for work during a thermodynamic process. It is often interpreted as the degree of disorder or randomness in the system. |
| FlowSpeed            | The rate at which particles or energy is passing through a unit area in a unit time.   |
| FlowVelocity         | The volume of matter passing through a unit area perpendicular to the direction of flow in a unit of time.   |

|                 |  |
|-----------------|--|
| Fluence         | The time integral of a flux. A fluence does not have any "per unit time" in its units.   |
| Gyrofrequency   | The number of gyrations around a magnetic guiding center (field line) a charged particle makes per unit time due to the Lorentz force.   |
| HeatFlux        | 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).  |
| MassDensity     | The mass of particles per unit volume.   |
| MassNumber      | The total number of protons and neutrons (together known as nucleons) in an atomic nucleus.  |
| NumberDensity   | The number of particles per unit volume.   |
| NumberFlux      | The number of particles passing a unit area in unit time, possibly also per unit energy (or equivalent) and/or per unit look direction.  |
| ParticleRadius  | The mean radius for a Gaussian distribution of particles with an axial ratio of 2 and a distribution width that varies as 0.5 radius. A value of zero means no cloud was detected.     |
| PlasmaFrequency | A number-density-dependent characteristic frequency of a plasma.   |
| Pressure        | The force per unit area exerted by a particle distribution or field.   |
| SonicMachNumber | The ratio of the bulk flow speed to the speed of sound in the medium.  |
| SoundSpeed      | The speed at which sound travels through a 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). |
| ThermalSpeed    | 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".  |

**ParticleType 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 a gas.   |
| AlphaParticle | A positively charged nuclear particle that consists of two protons and two neutrons.                                     |
| Atom          | Matter consisting of a nucleus surrounded by electrons which has no net charge.  |
| Dust          | Free microscopic particles of solid material.  |
| Electron      | An elementary particle consisting of a charge of negative electricity equal to about $1.602 \times 10^{-19}$ Coulomb and |

|          |  |
|----------|--|
|          | having a mass when at rest of about $9.109534 \times 10^{-28}$ 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         |
| Neutron  | An elementary particle that has no net charge and is a constituent of atomic nuclei, and that has a mass slightly large than a proton ( $1.673 \times 10^{-24}$ gram.)                                 |
| 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 $1.673 \times 10^{-24}$ gram. |

**PhenomenonType List**

Closed

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

| Term                        | Definition   |
|-----------------------------|--|
| ActiveRegion                | 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.  |
| BowShockCrossing            | A crossing of the boundary between the undisturbed (except for foreshock effects) solar wind and the shocked, decelerated solar wind of the magnetosheath.   |
| CoronalHole                 | 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. |
| CoronalMassEjection         | A solar event (CME) that involves a burst of plasma ejected into the interplanetary medium. CME's may be observed remotely relatively near the sun or in situ in the interplanetary medium. The latter type of observations are often referred to as Interplanetary CME's (ICME's).  |
| EITWave                     | 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.  |
| EnergeticSolarParticleEvent | An enhancement of interplanetary fluxes of energetic ions accelerated by interplanetary shocks and/or solar flares.  |



|                         |  |
|-------------------------|--|
| ForbushDecrease         | 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.  |
| GeomagneticStorm        | 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.   |
| InterplanetaryShock     | A shock propagating generally anti-sunward through the slower solar wind, often seen in front of CME-associated plasma clouds.   |
| MagneticCloud           | 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.   |
| MagnetopauseCrossing    | A crossing of the interface between the shocked solar wind in the magnetosheath and the magnetic field and plasma in the magnetosphere.  |
| RadioBurst              | 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" consisting 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" consisting of narrow-band bursts that sweep rapidly (seconds) from decimeter to dekameter wavelengths (500 - 0.5 MHz); and "Type IV" consisting of a smooth continuum of broad-band bursts primarily in the meter range (300 - 30 MHz). |
| SectorBoundaryCrossing  | A sector boundary crossing is a transit by a spacecraft across the heliospheric current sheet separating the dominantly outward (away-from-the-sun) interplanetary magnetic field of one hemisphere of the heliosphere from the dominantly inward (toward-the-sun) polarity of the other hemisphere. Such crossings have multi-day intervals of opposite IMF dominant polarities on either side.   |
| SolarFlare              | 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.  |
| SolarWindExtreme        | Intervals of unusually large or small values of solar wind attributes such as flow speed and ion density.  |
| StreamInteractionRegion | The region (SIR) where two solar wind streams, typically having differing characteristics and solar sources, abut up   |

Substorm against (and possibly partially interpenetrate) each other. A process by which plasma in the magnetotail becomes energized at a fast rate.

#### ProcessingLevel 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 data in physical units.          |
| Raw          | Data in its original state with no processing to account for calibration!!!  |
| 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. |

#### Projection List Closed

Identifiers to projections into a coordinate system.

| Term | Definition  |
|------|---|
| IJ   | A measure of the length of a position or measured vector projected into the i-j (typically X-Y) plane of the coordinate system. |
| IK   | A measure of the length of a position or measured vector projected into the i-k (typically X-Z) plane of the coordinate system. |
| JK   | A measure of the length of a position or measured vector projected into the j-k (typically Y-Z) plane of the coordinate system. |

#### Qualifier List Closed

Identifiers for terms which refine the type or attribute of a quantity.

| Term           | Definition   |
|----------------|--|
| Anisotropy     | Direction-dependent property.  |
| Array          | A sequence of values corresponding to the elements in a rectilinear, n-dimension matrix. Each value can be referenced by a unique index.   |
| Average        | The statistical mean; the sum of a set of values divided by the number of values in the set.   |
| Characteristic | A quantity which can be easily identified and measured in a given environment.   |
| 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.   |
| Column         | A two-dimensional measure of a quantity. The column is the area over which the quantity is measured.  |
| Component      | Projection of a vector along one of the base axes of a coordinate system.   |
| Confidence     | An expression of how certain that a quantity is valid or accurate.  |
| Core           | The central or main part of an object or calculated distribution. For example, the part of a distribution of particles at low energies that is a thermal (Maxwellian) population.   |
| CrossSpectrum  | 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.  |
| Differential   | A measurement within a narrow range of energy and/or solid angle.   |
| Direction      | The spatial relation between an object and another object, the orientation of the object or the course along which the object points or moves.  |
| DirectionAngle | The angle between a position vector or measured vector (or one of its projections onto a plane) and one of the base axes of the coordinate system.  |
| Directional    | A measurement within a narrow range of solid angle.   |
| Fit            | Values that make an model agree with the data.  |
| Group          | An assemblage of values that a certain relation or common characteristic.   |
| Halo           | The part of an object or distribution surrounding some central body or distribution. For example, the particles above the core energies that show enhancements above the thermal population. Typically, a "power law tail" shows a break from the core Maxwellian at a particular energy. |
| Integral       | A flux measurement in a broad range of energy and solid angle.  |
| LineOfSight    | 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         | Polarization where the E-field vector is confined to a given plane  |
| Magnitude      | A measure of the strength of a vector quantity or length of its representational vector.  |
| Maximum        | The largest value of a batch or sample or the upper bound of a probability distribution.  |
| Median         | The measure of central tendency of a set of n. values computed by ordering the values and taking the value at   |

|                   |   |
|-------------------|---|
|                   | position $(n. + 1) / 2$ when $n.$ is odd or the arithmetic mean of the values at positions $n. / 2$ and $(n. / 2) + 1$ when $n.$ is even.   |
| Minimum           | The smallest value of a batch or sample or the lower bound of a probability distribution.   |
| 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.   |
| Perturbation      | Variations in the state of a system.  |
| Phase             | A point or portion in a recurring series of changes.  |
| PhaseAngle        | Phase difference between two or more waves, normally expressed in degrees.  |
| Projection        | A measure of the length of a position or measured vector as projected into a plane of the coordinate system.  |
| Pseudo            | Similar to or having the appearance of something else.<br>Can be used to indicate an estimation or approximation of a particular quantity.  |
| Ratio             | The relative magnitudes of two quantities.  |
| Scalar            | A quantity that is completely specified by its magnitude and has no direction.  |
| Spectral          | Characterized as a range or continuum of frequencies  |
| StandardDeviation | 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.  |
| Strahl            | A distribution of particles concentrated in a narrow energy band. The band may be may be aligned with a secondary feature. For example, it may occur in a narrow cone aligned with the mean magnetic field direction.                       |
| Superhalo         | The part of an object or distribution surrounding some central body or distribution evident in a second break in the distribution function (e.g., a different power law). It consists of a population at a higher energies than for a halo. |
| Symmetric         | Equal distribution about one or more axes.  |
| 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.  |
| Total             | The summation of quantities over all possible species.  |
| Trace             | The sum of the elements on the main diagonal (the diagonal from the upper left to the lower right) of a square matrix.  |
| 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;). |
|--------|--|

### 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. |
| Interstellar | The region between stars outside of the star's heliopause.   |
| Jupiter      | The fifth planet from the sun in our solar system.   |
| Mars         | The fourth 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 eighth planet from the sun in our solar system.  |
| Venus        | The second planet from the sun in our solar system.  |

### RenderingAxis List Closed

Identifiers for the reference component of a plot or rendering of data.

| Term       | Definition   |
|------------|--|
| ColorBar   | A spectrum or set of colors used to represent data values. |
| Horizontal | Parallel to or in the plane of the horizon or a base line. |
| Vertical   | Perpendicular to the plane of the horizon or a base line.  |

### Role List Closed

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

| Term              | Definition  |
|-------------------|---|
| ArchiveSpecialist | An individual who is an expert on a collection of resources and may also be knowledgeable of the phenomenon and related physics represented by the resources. This includes librarians, curators, archive scientists and other experts. |
| Contributor       | An entity responsible for making contributions to the content of the resource.  |
| DataProducer      | An individual who generated the resource and is familiar with its provenance.   |
| GeneralContact    | An individual who can provide information on a range of   |

|                       |   |
|-----------------------|---|
| MetadataContact       | subjects or who can direct you to a domain expert.<br>An individual who can affect a change in the metadata describing a resource.                                    |
| PrincipalInvestigator | An individual who is the administrative and scientific lead for an investigation.   |
| ProjectScientist      | An individual who is an expert in the phenomenon and related physics explored by the project. A project scientist may also have a managerial 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.   |
| TeamLeader            | An individual who is the designated leader of an investigation.   |
| TeamMember            | An individual who is a major participant in an investigation.   |
| TechnicalContact      | An individual who can provide specific information with regard to the resource or supporting software   |

#### ScaleType List Closed

Identifiers for scaling applied to a set of numbers.

| Term        | Definition   |
|-------------|--|
| LinearScale | Intervals which are equally spaced.  |
| LogScale    | Intervals which are spaced proportionally to the logarithms of the values being represented. |

#### SourceType List Closed

Identifiers for the characterization of the function or purpose of a source.

| Term      | Definition  |
|-----------|---|
| Ancillary | A complementary item which can be subordinate, subsidiary, auxiliary, supplementary to the primary item.  |
| Browse    | A representation of an image which is suitable to reveal most or all of the details of the image.   |
| Data      | A collection of organized information, usually the results of experience, observation or experiment, or a set of premises. This may consist of numbers, words, or images, particularly as measurements or observations of a set of variables. |
| Layout    | The structured arrangement of items in a collection.  |
| Thumbnail | A small representation of an image which is suitable to infer what the full-sized imaged is like.   |

#### SpectralRange 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   |
|--------------------|--|
| CaK                | 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.             |
| ExtremeUltraviolet | 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               |
| FarUltraviolet     | A spectrum with a wavelength range of 122 nm to 200.0nm. VSO nickname: FUV image with a range of 122.0 nm to 200 nm                    |
| GammaRays          | Photons with a wavelength range: 0.00001 to 0.001 nm   |
| Halpa              | 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. |
| HardXrays          | Photons with a wavelength range: 0.001 to 0.1 nm and an energy range of 12 keV to 120 keV  |
| He10830            | 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.         |
| He304              | A spectrum centered around the resonance line of ionised helium at 304 Angstrom (30.4 nm).   |
| Infrared           | Photons with a wavelength range: 760 to 1.00x10 <sup>6</sup> nm  |
| K7699              | A spectrum with a wavelength range centred at 769.9 nm. VSO nickname: K-7699 dopplergram with a range of 769.8 nm to 770.0 nm.         |
| LBHBand            | Lyman-Birge-Hopfield band in the far ultraviolet range with wavelength range of 140nm to 170 nm.                                       |
| Microwave          | Photons with a wavelength range: 1.00x10 <sup>6</sup> to 1.50x10 <sup>7</sup> nm   |
| NaD                | 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.             |
| Ni6768             | 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   |
| RadioFrequency     | Photons with a wavelength range: 100,000 to 1.00x10 <sup>11</sup> nm   |
| SoftXRays          | X-Rays with an energy range of 0.12 keV to 12 keV.   |
| Ultraviolet        | Photons with a wavelength range: 10 to 400 nm.   |
| WhiteLight         | Photons with a wavelength in the visible range for humans.   |
| XRays              | Photons with a wavelength range: 0.001 <= x < 10 nm  |

**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 |



|                  |   |
|------------------|---|
| Corona           | 2100 km above the photosphere, and characterized by temperatures from 4500 - 28000 K.<br>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.   |
| TransitionRegion | 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.  |

**SupportQuantity List**

Closed

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

| Term           | Definition  |
|----------------|---|
| InstrumentMode | An indication of a state (mode) in which the instrument is operating. How a mode influences the interpretation and representation of data is described in instrument related documentation.   |
| Other          | Not classified with more specific terms. The context of its usage may be described in related text.   |
| 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.   |
| Velocity       | Rate of change of position. Also used for the average velocity of a collection of particles, also referred to as "bulk velocity".   |

**Text List**

Closed

Identifiers for the encoding of sequences of characters.

| 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. |
| Unicode | Text in multi-byte Unicode format.   |

**WaveQuantity List**

Closed

Identifiers for the characterization of the physical properties of a wave.

| Term            | Definition                                      |
|-----------------|---|
| ACElectricField | Alternating electric field component of a wave. |
| ACMagneticField | Alternating magnetic field component of a wave. |

|                  |   |
|------------------|---|
| Absorption       | Decrease of radiant energy (relative to the background continuum spectrum).   |
| Albedo           | The ratio of reflected radiation from the surface to incident radiation upon it.  |
| DopplerFrequency | Change in the frequency of a propagating wave due to motion of the source, the observer, the reflector, or the propagation medium.  |
| Emissivity       | The energy emitted spontaneously per unit bandwidth (typically frequency) per unit time per unit mass of source. Emissivity is usually integrated over all directions/solid angles.   |
| EnergyFlux       | The amount of energy passing through a unit area in a unit time.  |
| EquivalentWidth  | The spectral width of a total absorption line having the amount of absorbed radiant energy being equivalent to that in an observed absorption line.   |
| Frequency        | The number of occurrences of a repeating event per unit time.   |
| Gyrofrequency    | The number of gyrations around a magnetic guiding center (field line) a charged particle makes per unit time due to the Lorentz force.  |
| Intensity        | The measurement of radiant or wave energy per unit detector area per unit bandwidth per unit solid angle per unit time.   |
| LineDepth        | The measure of the amount of absorption below the continuum (depth) in a particular wavelength or frequency in an absorption spectrum.  |
| MagneticField    | A region of space near a magnetized body where magnetic forces can be detected (as measured by methods such as Zeeman splitting, etc.).   |
| ModeAmplitude    | In helioseismology the magnitude of oscillation of waves of a particular geometry.  |
| PlasmaFrequency  | A number-density-dependent characteristic frequency of a plasma.  |
| 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. |
| PoyntingFlux     | Electromagnetic energy flux transported by a wave characterized as the rate of energy transport per unit area per steradian.  |
| PropagationTime  | Time difference between transmission and reception of a wave in an active wave experiment.  |
| Velocity         | Rate of change of position. Also used for the average velocity of a collection of particles, also referred to as "bulk velocity".   |
| Wavelength       | The peak-to-peak distance over one wave period.   |

**WaveType List**

Closed

Identifiers for the carrier or phenomenon of wave information observed by the measurement.

|      |
|------|
| Term |
|------|

|                     | Definition   |
|---------------------|--|
| Electromagnetic     | Electric and magnetic field variations in time and space that propagate through a medium or a vacuum with the wave's propagation, electric field, and magnetic field vectors forming an orthogonal triad. Waves in this category are detected by having their field quantities measured. |
| Electrostatic       | Collective longitudinal electric-field and plasma oscillations trapped within a body of plasma.  |
| Hydrodynamic<br>MHD | Periodic or quasi-periodic oscillations of fluid quantities. Hydrodynamic waves in a magnetized plasma in which the background magnetic field plays a key role in controlling the wave propagation characteristics.  |
| Photon              | Electromagnetic waves detected by techniques that utilize their corpuscular character (e.g., CCD, CMOS, photomultipliers).   |
| PlasmaWaves         | Self-consistent collective oscillations of particles and fields (electric and magnetic) in a plasma.   |

**Waves List**

Closed

Identifiers for experimental and natural wave phenomena.

| Term    | Definition   |
|---------|--|
| Active  | Exerting an influence or producing a change or effect. An active measurement is one which produces a transmission or excitation as a part of the measurement cycle.    |
| Passive | Movement or effect produced by outside influence. A passive measurement is one which does not produce a transmission or excitation as a part of the measurement cycle. |

## 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 <sub>1</sub> | 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 <sup>6</sup>     | 700                | 10 <sup>6</sup>    | 700                 | 3.5*10 <sup>5</sup> |
| Near IR          | 760                    | 1400                | 700                | 25*10 <sup>2</sup> | 700                 |                     |
| Mid IR           | 1400                   | 3000                | 25*10 <sup>2</sup> | 5*10 <sup>4</sup>  |                     |                     |
| Far IR           | 3000                   | 10 <sup>6</sup>     | 5*10 <sup>4</sup>  | 10 <sup>6</sup>    | 3.5*10 <sup>5</sup> |                     |
| Microwaves       | 10 <sup>6</sup>        | 1.5*10 <sup>7</sup> | 10 <sup>6</sup>    | 10 <sup>9</sup>    |                     |                     |
| Radio            | 10 <sup>5</sup>        | 10 <sup>11</sup>    | 10 <sup>9</sup>    | -                  | 10 <sup>7</sup>     | 10 <sup>9</sup>     |

<sup>1</sup> Also called "XUV" in ISO 21348

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Base units: [http://www.bipm.fr/en/si/si\\_brochure/chapter2/2-1/#symbols](http://www.bipm.fr/en/si/si_brochure/chapter2/2-1/#symbols)

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<http://www.iso.ch/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=40874>

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## 12. Change History

|               |  |
|---------------|--|
| <b>0.99.1</b> |  |
| 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.  |
| <b>0.99.2</b> |  |
| 2005-07-07    | Corrected "Numerical Data" entry under Product   |
| 2005-07-07    | Released.  |
| <b>0.99.3</b> |  |
| 2005-08-03    | Added definitions supplied by J. Thieman, C. Harvey and T.King; Significant revision of document as suggested by Joe Hourcle |
| <b>0.99.4</b> |  |
| 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.  |
| <b>0.99.5</b> |  |
| 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.  |
| <b>0.99.6</b> |  |
| 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.  |
| <b>0.99.7</b> |  |
| 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.   |
| <b>0.99.8</b> |   |
| 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.   |
| <b>0.99.9</b> |   |
| 2005-11-18    | Incorporate comments from consortium members on the "final" draft before the release of version 1.0                 |
| 2005-11-18    | Released.   |
| <b>1.0.0</b>  |   |
| 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.   |
| <b>1.0.1</b>  |   |
| 2006-01-03    | Changes in value type for elements: Exposure, InputResourceID, RepositoryName, Size.                                |
| 2006-01-03    | Added elements: Pressure.   |
| 2006-01-03    | Released.   |
| <b>1.0.2</b>  |   |
| 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.   |
| <b>1.0.3</b>  |   |
| 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**


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|            |  |
|------------|--|
| 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**


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

**1.2.0**


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|            |  |
|------------|--|
| 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

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|------------|--|
| 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, Coronagraph, 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".

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| 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

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|            |   |
|------------|---|
| 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

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|            |  |
|------------|--|
| 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

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|            |   |
|------------|---|
| 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. |
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### 1.3.4

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|------------|--|
| 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

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| 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

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

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2009-04-15 Released.

## 2.0.1

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|            |   |
|------------|---|
| 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

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|            |   |
|------------|---|
| 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

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|            |   |
|------------|---|
| 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

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2010-03-19 Released.

## 2.2.0

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|            |  |
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| 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"; |
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|            |  |
|------------|--|
|            | 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";  |
| 2010-08-20 | updated definition for "Energy Flux" and "Differential"  |
| 2010-09-15 | Updated definitions of "Outer", "Inner", "Heliosheath" and "Remote 1AU"  |
|            | 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 "irradiance".   |
| 2011-01-06 | Released.  |

### 2.2.1

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|            |  |
|------------|--|
| 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

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|            |   |
|------------|---|
| 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

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

#### 2.2.4

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

#### 2.2.5

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

#### 2.2.6

|            |           |
|------------|-----------|
| 2015-09-09 | Released. |
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#### 2.2.7

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

#### 2.2.8

|            |           |
|------------|-----------|
| 2016-07-21 | Released. |
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#### 2.2.9

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