A Space and Solar Physics Data Model

from the SPASE Consortium

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Table of Contents

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 for1992 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 resources 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 full 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 lead to further improvements of the data model. Version1.1 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).

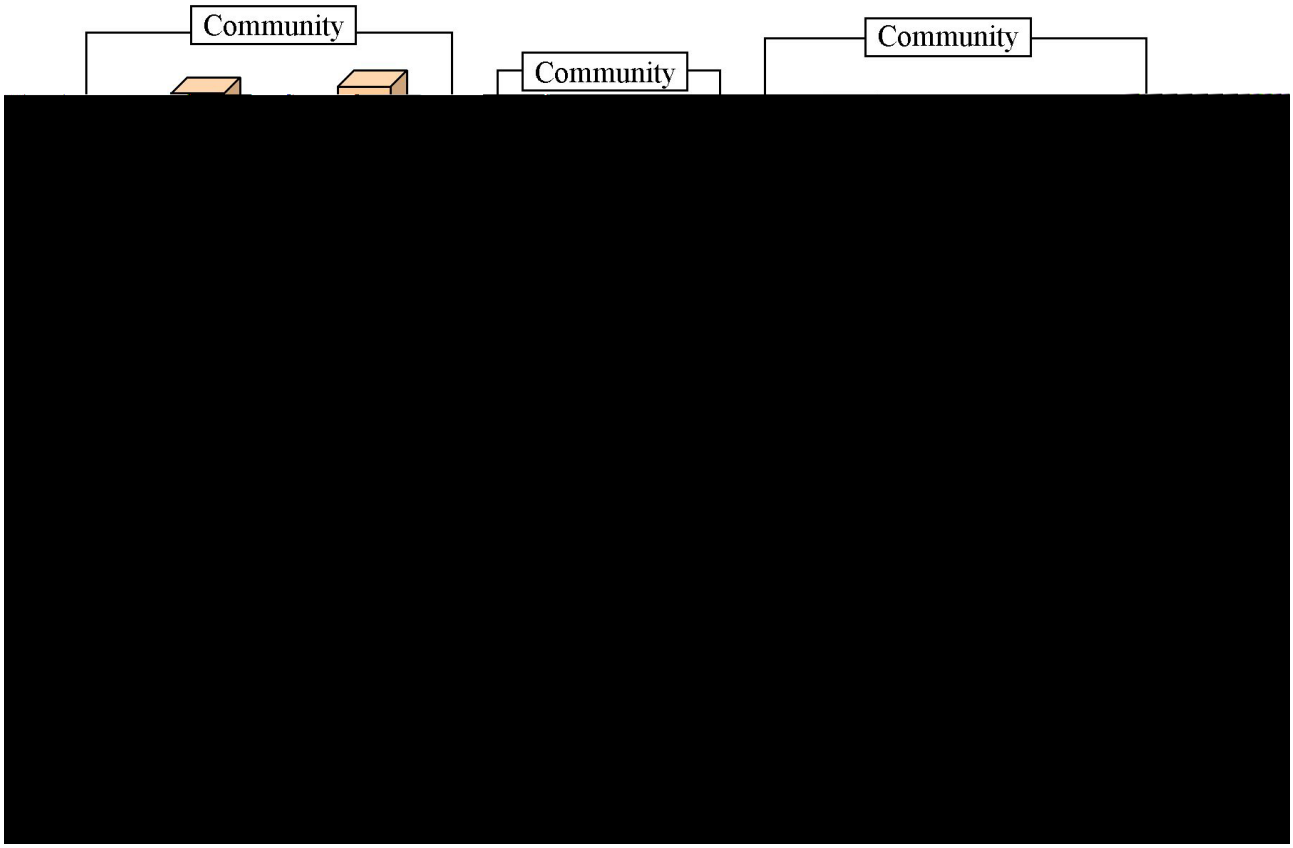
4. The data environment is continuously evolving. New resources are actively generated either as part of an on-going experiment or as a result of analysis and assessment.

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.



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 individual data products or data product sets. 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.

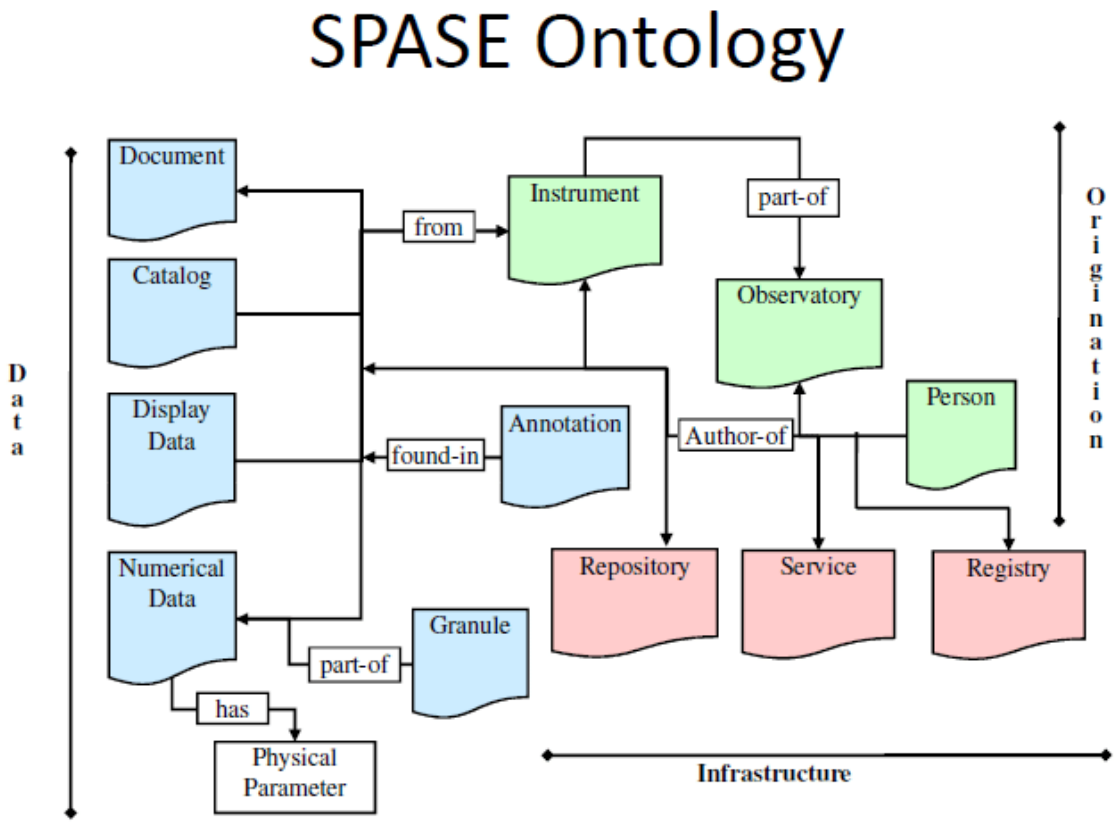


Figure 2: The association map between resources in the SPASE model. Arrows point in the direction of association.

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

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

| | + Instrument ID (*)
| | + Phenomenon Type (+)
| | + Time Span (0)
| | | + Start Date (1)
| | | + Stop Date (1 of B)
| | | + Relative Stop Date (1 of B)
| | | + Note (*)
| | + Caveats (0)
| | + Keyword (*)
| | + Input Resource ID (*)
| | + Parameter (*)
| | | + Name (1)
| | | + Set (*)
| | | + Parameter Key (0)
| | | + Description (0)
| | | + Caveats (0)
| | | + Cadence (0)
| | | + Units (0)
| | | + Units Conversion (0)
| | | + Coordinate System (0)
| | | | + Coordinate Representation (0)
| | | | + Coordinate System Name (0)
| | | + Rendering Hints (*)
| | | | + Display Type (0)
| | | | + Axis Label (0)
| | | | + Value Format (0)
| | | | + Scale Min (0)
| | | | + Scale Max (0)
| | | | + Scale Type (0)
| | | + Structure (0)
| | | | + Size (0)
| | | | + Description (0)
| | | | + Element (*)
| | | | | + Name (1)
| | | | | + Qualifier (*)
| | | | | + Index (1)
| | | | | + Parameter Key (0)
| | | | | + Units (0)
| | | | | + Units Conversion (0)
| | | | | + Valid Min (0)
| | | | | + Valid Max (0)
| | | | | + Fill Value (0)
| | | + Valid Min (0)
| | | + Valid Max (0)
| | | + Fill Value (0)
| | | + Field (1 of C)
| | | | + Qualifier (*)
| | | | + Field Quantity (1)
| | | | + Frequency Range (0)
| | | | | + Spectral Range (0)
| | | | | + Low (1)

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

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

```
|       |       |       |       + Description (0)
|       |       |       |       + Language (0)
|       |       |       + Format (1)
|       |       |       + Encoding (0)
|       |       |       + Data Extent (0)
|       |       |       |       + Quantity (1)
|       |       |       |       + Units (0)
|       |       |       |       + Per (0)
|       |       |       + Acknowledgement (0)
|       |       + Processing Level (0)
|       |       + Provider Resource Name (0)
|       |       + Provider Processing Level (0)
|       |       + Provider Version (0)
|       |       + Instrument ID (*)
|       |       + Measurement Type (+)
|       |       + Temporal Description (0)
|       |       |       + Time Span (1)
|       |       |       |       + Start Date (1)
|       |       |       |       + Stop Date (1 of B)
|       |       |       |       + Relative Stop Date (1 of B)
|       |       |       |       + Note (*)
|       |       |       + Cadence (0)
|       |       |       + Exposure (0)
|       |       + Spectral Range (*)
|       |       + Display Cadence (0)
|       |       + Observed Region (*)
|       |       + Caveats (0)
|       |       + Keyword (*)
|       |       + Input Resource ID (*)
|       |       + Parameter (*)
|       |       |       + Name (1)
|       |       |       + Set (*)
|       |       |       + Parameter Key (0)
|       |       |       + Description (0)
|       |       |       + Caveats (0)
|       |       |       + Cadence (0)
|       |       |       + Units (0)
|       |       |       + Units Conversion (0)
|       |       |       + Coordinate System (0)
|       |       |       |       + Coordinate Representation (0)
|       |       |       |       + Coordinate System Name (0)
|       |       |       + Rendering Hints (*)
|       |       |       |       + Display Type (0)
|       |       |       |       + Axis Label (0)
|       |       |       |       + Value Format (0)
|       |       |       |       + Scale Min (0)
|       |       |       |       + Scale Max (0)
|       |       |       |       + Scale Type (0)
|       |       |       + Structure (0)
|       |       |       |       + Size (0)
|       |       |       |       + Description (0)
```

```
|       |       |       |       + Element (*)
|       |       |       |       |       + Name (1)
|       |       |       |       |       + Qualifier (*)
|       |       |       |       |       + Index (1)
|       |       |       |       |       + Parameter Key (0)
|       |       |       |       |       + Units (0)
|       |       |       |       |       + Units Conversion (0)
|       |       |       |       |       + Valid Min (0)
|       |       |       |       |       + Valid Max (0)
|       |       |       |       |       + Fill Value (0)
|       |       |       + Valid Min (0)
|       |       |       + Valid Max (0)
|       |       |       + Fill Value (0)
|       |       |       + Field (1 of C)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Field Quantity (1)
|       |       |       |       + Frequency Range (0)
|       |       |       |       |       + Spectral Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
|       |       |       |       |       + Units (1)
|       |       |       |       |       + Bin (*)
|       |       |       |       |       |       + Band Name (0)
|       |       |       |       |       |       + Low (1)
|       |       |       |       |       |       + High (1)
|       |       |       + Particle (1 of C)
|       |       |       |       + Particle Type (+)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Particle Quantity (1)
|       |       |       |       + Atomic Number (*)
|       |       |       |       + Energy Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
|       |       |       |       |       + Units (1)
|       |       |       |       |       + Bin (*)
|       |       |       |       |       |       + Band Name (0)
|       |       |       |       |       |       + Low (1)
|       |       |       |       |       |       + High (1)
|       |       |       |       + Azimuthal Angle Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
|       |       |       |       |       + Units (1)
|       |       |       |       |       + Bin (*)
|       |       |       |       |       |       + Band Name (0)
|       |       |       |       |       |       + Low (1)
|       |       |       |       |       |       + High (1)
|       |       |       |       + Polar Angle Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
|       |       |       |       |       + Units (1)
|       |       |       |       |       + Bin (*)
```

```
|       |       |       |       |       |       + Band Name (0)
|       |       |       |       |       |       + Low (1)
|       |       |       |       |       |       + High (1)
|       |       |       + Wave (1 of C)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Wave Type (1)
|       |       |       |       + Wave Quantity (1)
|       |       |       |       + Energy Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
|       |       |       |       |       + Units (1)
|       |       |       |       |       + Bin (*)
|       |       |       |       |       |       + Band Name (0)
|       |       |       |       |       |       + Low (1)
|       |       |       |       |       |       + High (1)
|       |       |       |       + Wavelength Range (0)
|       |       |       |       |       + Spectral Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
|       |       |       |       |       + Units (1)
|       |       |       |       |       + Bin (*)
|       |       |       |       |       |       + Band Name (0)
|       |       |       |       |       |       + Low (1)
|       |       |       |       |       |       + High (1)
|       |       |       |       + Frequency Range (0)
|       |       |       |       |       + Spectral Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
|       |       |       |       |       + Units (1)
|       |       |       |       |       + Bin (*)
|       |       |       |       |       |       + Band Name (0)
|       |       |       |       |       |       + Low (1)
|       |       |       |       |       |       + High (1)
|       |       |       + Mixed (1 of C)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Mixed Quantity (1)
|       |       |       |       + Particle Type (*)
|       |       |       + Support (1 of C)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Support Quantity (1)
|       |       + Extension (*)
|       + Numerical Data (+ of A)
|       |       + Resource ID (1)
|       |       + Resource Header (1)
|       |       |       + Resource Name (1)
|       |       |       + Alternate Name (*)
|       |       |       + Release Date (1)
|       |       |       + Expiration Date (0)
|       |       |       + Description (1)
|       |       |       + Acknowledgement (0)
|       |       |       + Contact (+)
```

```
|       |       |       |       + Person ID (1)
|       |       |       |       + Role (+)
|       |       |       + Information URL (*)
|       |       |       |       + Name (0)
|       |       |       |       + URL (1)
|       |       |       |       + Description (0)
|       |       |       |       + Language (0)
|       |       |       + Association (*)
|       |       |       |       + Association ID (0)
|       |       |       |       + Association Type (0)
|       |       |       |       + Note (0)
|       |       |       + Prior ID (*)
|       |       + Access Information (+)
|       |       |       + Repository ID (1)
|       |       |       + Availability (0)
|       |       |       + Access Rights (0)
|       |       |       + Access URL (+)
|       |       |       |       + Name (0)
|       |       |       |       + URL (1)
|       |       |       |       + Description (0)
|       |       |       |       + Language (0)
|       |       |       + Format (1)
|       |       |       + Encoding (0)
|       |       |       + Data Extent (0)
|       |       |       |       + Quantity (1)
|       |       |       |       + Units (0)
|       |       |       |       + Per (0)
|       |       |       + Acknowledgement (0)
|       |       + Processing Level (0)
|       |       + Provider Resource Name (0)
|       |       + Provider Processing Level (0)
|       |       + Provider Version (0)
|       |       + Instrument ID (*)
|       |       + Measurement Type (+)
|       |       + Temporal Description (0)
|       |       |       + Time Span (1)
|       |       |       |       + Start Date (1)
|       |       |       |       + Stop Date (1 of B)
|       |       |       |       + Relative Stop Date (1 of B)
|       |       |       |       + Note (*)
|       |       |       + Cadence (0)
|       |       |       + Exposure (0)
|       |       + Spectral Range (*)
|       |       + Observed Region (*)
|       |       + Caveats (0)
|       |       + Keyword (*)
|       |       + Input Resource ID (*)
|       |       + Parameter (*)
|       |       |       + Name (1)
|       |       |       + Set (*)
|       |       |       + Parameter Key (0)
```

```
|       |       |       + Description (0)
|       |       |       + Caveats (0)
|       |       |       + Cadence (0)
|       |       |       + Units (0)
|       |       |       + Units Conversion (0)
|       |       |       + Coordinate System (0)
|       |       |       |       + Coordinate Representation (0)
|       |       |       |       + Coordinate System Name (0)
|       |       |       + Rendering Hints (*)
|       |       |       |       + Display Type (0)
|       |       |       |       + Axis Label (0)
|       |       |       |       + Value Format (0)
|       |       |       |       + Scale Min (0)
|       |       |       |       + Scale Max (0)
|       |       |       |       + Scale Type (0)
|       |       |       + Structure (0)
|       |       |       |       + Size (0)
|       |       |       |       + Description (0)
|       |       |       |       + Element (*)
|       |       |       |       |       + Name (1)
|       |       |       |       |       + Qualifier (*)
|       |       |       |       |       + Index (1)
|       |       |       |       |       + Parameter Key (0)
|       |       |       |       |       + Units (0)
|       |       |       |       |       + Units Conversion (0)
|       |       |       |       |       + Valid Min (0)
|       |       |       |       |       + Valid Max (0)
|       |       |       |       |       + Fill Value (0)
|       |       |       + Valid Min (0)
|       |       |       + Valid Max (0)
|       |       |       + Fill Value (0)
|       |       |       + Field (1 of C)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Field Quantity (1)
|       |       |       |       + Frequency Range (0)
|       |       |       |       |       + Spectral Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
|       |       |       |       |       + Units (1)
|       |       |       |       |       + Bin (*)
|       |       |       |       |       |       + Band Name (0)
|       |       |       |       |       |       + Low (1)
|       |       |       |       |       |       + High (1)
|       |       |       + Particle (1 of C)
|       |       |       |       + Particle Type (+)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Particle Quantity (1)
|       |       |       |       + Atomic Number (*)
|       |       |       |       + Energy Range (0)
|       |       |       |       |       + Low (1)
|       |       |       |       |       + High (1)
```

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

```
|       |       |       + Mixed (1 of C)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Mixed Quantity (1)
|       |       |       |       + Particle Type (*)
|       |       |       + Support (1 of C)
|       |       |       |       + Qualifier (*)
|       |       |       |       + Support Quantity (1)
|       |       + Extension (*)
|       + Document (+ of A)
|       |       + Resource ID (1)
|       |       + Resource Header (1)
|       |       |       + Resource Name (1)
|       |       |       + Alternate Name (*)
|       |       |       + Release Date (1)
|       |       |       + Expiration Date (0)
|       |       |       + Description (1)
|       |       |       + Acknowledgement (0)
|       |       |       + Contact (+)
|       |       |       |       + Person ID (1)
|       |       |       |       + Role (+)
|       |       |       + Information URL (*)
|       |       |       |       + Name (0)
|       |       |       |       + URL (1)
|       |       |       |       + Description (0)
|       |       |       |       + Language (0)
|       |       |       + Association (*)
|       |       |       |       + Association ID (0)
|       |       |       |       + Association Type (0)
|       |       |       |       + Note (0)
|       |       |       + Prior ID (*)
|       |       + Access Information (+)
|       |       |       + Repository ID (1)
|       |       |       + Availability (0)
|       |       |       + Access Rights (0)
|       |       |       + Access URL (+)
|       |       |       |       + Name (0)
|       |       |       |       + URL (1)
|       |       |       |       + Description (0)
|       |       |       |       + Language (0)
|       |       |       + Format (1)
|       |       |       + Encoding (0)
|       |       |       + Data Extent (0)
|       |       |       |       + Quantity (1)
|       |       |       |       + Units (0)
|       |       |       |       + Per (0)
|       |       |       + Acknowledgement (0)
|       |       + Keyword (*)
|       |       + Document Type (1)
|       |       + Input Resource ID (*)
|       + Granule (+ of A)
|       |       + Resource ID (1)
```

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

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

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

```
|       |       |       |       + Name (0)
|       |       |       |       + URL (1)
|       |       |       |       + Description (0)
|       |       |       |       + Language (0)
|       |       |       + Association (*)
|       |       |       |       + Association ID (0)
|       |       |       |       + Association Type (0)
|       |       |       |       + Note (0)
|       |       |       + Prior ID (*)
|       |       + Access URL (1)
|       |       |       + Name (0)
|       |       |       + URL (1)
|       |       |       + Description (0)
|       |       |       + Language (0)
|       |       + Extension (*)
|       + Annotation (+ of A)
|       |       + Resource ID (1)
|       |       + Resource Header (1)
|       |       |       + Resource Name (1)
|       |       |       + Alternate Name (*)
|       |       |       + Release Date (1)
|       |       |       + Expiration Date (0)
|       |       |       + Description (1)
|       |       |       + Acknowledgement (0)
|       |       |       + Contact (+)
|       |       |       |       + Person ID (1)
|       |       |       |       + Role (+)
|       |       |       + Information URL (*)
|       |       |       |       + Name (0)
|       |       |       |       + URL (1)
|       |       |       |       + Description (0)
|       |       |       |       + Language (0)
|       |       |       + Association (*)
|       |       |       |       + Association ID (0)
|       |       |       |       + Association Type (0)
|       |       |       |       + Note (0)
|       |       |       + Prior ID (*)
|       |       + Image URL (0)
|       |       + Annotation Type (1)
|       |       + Phenomenon Type (0)
|       |       + Classification Method (0)
|       |       + Confidence Rating (0)
|       |       + Time Span (*)
|       |       |       + Start Date (1)
|       |       |       + Stop Date (1 of B)
|       |       |       + Relative Stop Date (1 of B)
|       |       |       + Note (*)
|       |       + Observation Extent (*)
|       |       |       + Observed Region (0)
|       |       |       + Start Location (1)
|       |       |       + Stop Location (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 neccesary 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>
           <SuportQuantity>Temporal</SuportQuantity>
         </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>
```

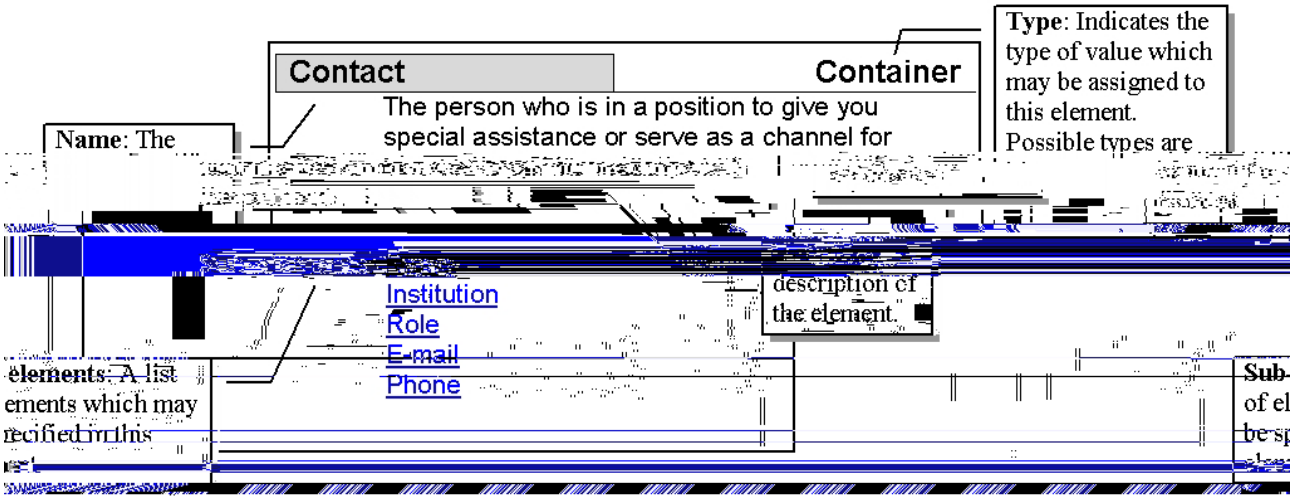
```
      <CoordinateSystem>
         <CoordinateRepresentation>Cartesian</CoordinateRepresentation>
         <CoordinateSystemName>GSE</CoordinateSystemName>
      </CoordinateSystem>
      <Units>EARTH RADII</Units>
      <UnitsConversion>6378.16 km</UnitsConversion>
      <Description>
         ACE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



AC-Electric Field — Item

Alternating electric field component of a wave.

AC-Magnetic Field — Item

Alternating magnetic field component of a wave.

ASCII — Item

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

AVI — Item

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

Absorption — Item

Decrease of radiant energy (relative to the background continuum spectrum).

Access Information — Container

Attributes of the resource which pertain to how to accessing the resource, availability and storage format.

Sub-elements:

- Access Rights
- Access URL
- Acknowledgement
- Availability
- Data Extent
- Encoding
- Format
- Repository ID

Access Rights — Enumeration

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

Allowed Values:

- Open
- Restricted

Access URL — Container

Attributes of the method for accessing a resource including a URL, name and description.

Sub-elements:

- Description
- Language
- Name
- URL

Acknowledgement — Text

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

Active — 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.

Active Region — Item

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

Activity Index — Item

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

Address — Text

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

Aerosol — Item

A suspension of fine solid or liquid particles in a gas.

Akasofu Epsilon — Item

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^2sin(theta/2)^4 where B is the IMF, l is an empirical scaling parameter equal to 7 RE, and theta = tan(BY /BZ)^-1 the IMF clock angle.

Alfven Mach Number — Item

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

Alfven Velocity — Item

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).

Alpha Particle — Item

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

Alternate Name — Text

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

Ancillary — Item

A complementary item which can be subordinate, subsidiary, auxiliary, supplementary to the primary item.

Anisotropy — Item

Direction-dependent property.

Annotation — Container

Information which is explanatory or descriptive which is associated with another resource.

Sub-elements:

- Annotation Type
- Classification Method
- Confidence Rating
- Extension
- Image URL
- Observation Extent
- Phenomenon Type
- Resource Header
- Resource ID
- Time Span

Annotation Type — Enumeration

A classification for an annotation.

Allowed Values:

- Anomaly
- Event
- Feature

Anomaly — Item

An interval where measurements or observations may be adversely affected.

Antenna — Item

A sensor used to measure electric potential.

Archive Specialist — Item

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

Area — Item

Integration over the extent of a planar region, or of the surface of a solid.

Array — Item

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

Arrival Direction — 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.

Association — Container

Attributes of a relationship a resource has with another resource.

Sub-elements:

- Association ID
- Association Type
- Note

Association ID — Text

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

Association Type — Enumeration

A characterization of the role or purpose of an associated resource.

Allowed Values:

- Child Event Of
- Derived From
- Observed By
- Other
- Part Of
- Revision Of

Asteroid — Item

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

Atmosphere — Item

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

Atom — Item

Matter consisting of a nucleus surrounded by electrons which has no net charge.

Atomic Number — Numeric

The number of protons in the nucleus of an atom.

Atomic Number Detected — Item

The number of protons in the nucleus of an atom as determined by a detector.

Aurora — Item

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

Auroral Region — Item

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

Automatic — Item

Determined by the analysis or assessment performed by a program or server.

Availability — Enumeration

An indication of the method or service which may be used to access the resource.

Allowed Values:

Offline
Online

Average — Item

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

Average Charge State — Item

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

Axis Label — 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.

Azimuth Angle — 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).

Azimuthal Angle Range — Container

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

Sub-elements:

Bin
High
Low
Units

BZIP2 — Item

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

Band Name — Text

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

Bandwidth — Item

Integration over the width a frequency band.

Base64 — Item

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

Bin — Container

A grouping of observations according to a band or window of a common attribute.

Sub-elements:

Band Name
High
Low

Binary — Item

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

Bow Shock Crossing — Item

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

Browse — Item

A representation of an image which is suitable to reveal most or all of the details of the image.

CDF — Item

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

CEF — Item

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

CEF 1 — Item

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

CEF 2 — Item

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

CGM — Item

Corrected Geomagnetic - A coordinate system from a spatial point with GEO radial distance and geomagnetic latitude and longitude, follow the epoch-appropriate IGRF/DGRF model field vector through to the point where the field line crosses the geomagnetic dipole equatorial plane. Then trace the dipole magnetic field vector Earthward from that point on the equatorial plane, in the same hemisphere as the original point, until the initial radial distance is reached. Designate the dipole latitude and longitude at that point as the CGM latitude and longitude of the original point. See <http://nssdc.gsfc.nasa.gov/space/cgm/cgmm_des.html>

Ca-K — Item

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

Cadence — Duration

The time interval between the start of successive measurements.

Calibrated — Item

Data wherein sensor outputs have been convolved with instrument response function, often irreversibly, to yield data in physical units.

Carrington — Item

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.

Cartesian — Item

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.

Catalog — Container

A tabular listing of events or observational notes, especially those that have utility in aiding a user in locating data. Catalogues include lists of events, files in a product, and data availability.

Sub-elements:

- Access Information
- Caveats

Extension
Input Resource ID
Instrument ID
Keyword
Parameter
Phenomenon Type
Provider Resource Name
Provider Version
Resource Header
Resource ID
Time Span

Caveats — Text

Information which may be important in the avoidance of the misuse of the resource, for instance instrument maladies, corruption or contamination.

Channeltron — Item

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

Characteristic — Item

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

Charge State — Item

Charge of a fully or partially stripped ion, in units of the charge of a proton. Charge state of a bare proton = 1.

Checksum — Container

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

Sub-elements:

Hash Function
Hash Value

Child Event Of — 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.

Classification Method — Enumeration

The technique used to determine the characteristics of an object.

Allowed Values:

Automatic
Inferred
Inspection

Co-Investigator — Item

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

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 Rating — Enumeration

A classification of the certainty of an assertion.

Allowed Values:

Probable
Strong
Unlikely
Weak

Contact — Container

The person or organization who may be able to provide special assistance or serve as a channel for communication for additional information about a resource.

Sub-elements:

Person ID
Role

Contributor — Item

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

Coordinate Representation — Enumeration

The method or form for specifying a given point or vector in a given coordinate system.

Allowed Values:

Cartesian
Cylindrical
Spherical

Coordinate System — Container

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

Sub-elements:

Coordinate Representation
Coordinate System Name

Coordinate System Name — Enumeration

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

Allowed Values:

CGM
Carrington
DM
GEI
GEO
GSE
GSEQ
GSM
HAE

HCI
HEE
HEEQ
HG
HGI
J2000
LGM
MAG
MFA
RTN
SC
SE
SM
SR
SR2
SSE
Spacecraft Orbit Plane
WGS84

Corona Item

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

Coronal Hole Item

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

Coronal Mass Ejection Item

A solar event (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).

Coronograph Item

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

Count Rate Item

The number of events per unit time.

Counts Item

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

Cross Spectrum Item

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

Current Item

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

Cylindrical Item

A 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.

D-Region Item

The layer of the ionosphere that exists approximately 50 to 95 km above the surface of the

Earth. One of several layers in the ionosphere.

DM — Item

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

Data — Item

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.

Data Extent — Container

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
Quantity
Units

Data Producer — Item

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

Deputy-PI — Item

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

Derived From — Item

A transformed or altered version of a resource instance.

Description — Text

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.

Deviation — Item

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

Differential — Item

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

Direction — Item

The spatial relation between an object and another object, the orientation of the object or the course along which the object points or moves.

Direction Angle — Enumeration

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:

Azimuth Angle
Elevation Angle
Polar Angle

Display Cadence — Duration

The time interval between the successive display elements.

Display Data — Container

A graphical representation of data wherein the underlying numeric values are not (readily)

accessible for analysis.. Examples are line plots and spectrograms.

Sub-elements:

Access Information
Caveats
Display Cadence
Extension
Input Resource ID
Instrument ID
Keyword
Measurement Type
Observed Region
Parameter
Processing Level
Provider Processing Level
Provider Resource Name
Provider Version
Resource Header
Resource ID
Spectral Range
Temporal Description

Display Type — Enumeration

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

Allowed Values:

Image
Plasmagram
Spectrogram
Stack Plot
Time Series
Wave Form

Document — Container

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. Some examples of documents include a paper, letter, book, user guide, map, drawing, photograph, or image.

Sub-elements:

Access Information
Document Type
Input Resource ID
Keyword
Resource Header
Resource ID

Document Type — Enumeration

A characterization of the content or purpose of a document.

Allowed Values:

Paper

Doppler Frequency — Item

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

Dopplergram — Item

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

Double Sphere — Item

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

Dust — Item

Free microscopic particles of solid material.

Dust Detector — Item

An instrument which determines the mass and speed of ambient dust particles.

E-Region — Item

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

EIT Wave — Item

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

Earth — Enumeration

The third planet from the sun in our solar system.

Allowed Values:

Magnetosheath
Magnetosphere
Magnetosphere.Magnetotail
Magnetosphere.Main
Magnetosphere.Polar
Magnetosphere.Radiation Belt
Near Surface
Near Surface.Atmosphere
Near Surface.Auroral Region
Near Surface.Equatorial Region
Near Surface.Ionosphere
Near Surface.Ionosphere.D-Region
Near Surface.Ionosphere.E-Region
Near Surface.Ionosphere.F-Region
Near Surface.Ionosphere.Topside
Near Surface.Mesosphere
Near Surface.Plasmasphere
Near Surface.Polar Cap
Near Surface.South Atlantic Anomaly Region
Near Surface.Stratosphere
Near Surface.Thermosphere
Near Surface.Troposphere
Surface

Electric — Item

The physical attribute that exerts an electrical force.

Electric Field — Item

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.

Electromagnetic — Item

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.

Electron — Item

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

Electron Drift Instrument — Item

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

Electrostatic — Item

Collective longitudinal electric-field and plasma oscillations trapped within a body of plasma.

Electrostatic Analyser — Item

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

Element — Container

A component or individual unit of a multiple value quantity such as an array or vector.

Sub-elements:

- Fill Value
- Index
- Name
- Parameter Key
- Qualifier
- Units
- Units Conversion
- Valid Max
- Valid Min

Elevation — Numeric

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

Elevation Angle — Item

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)).

Email — Text

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

Emissivity — Item

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.

Encoding — Enumeration

A set of unambiguous rules that establishes the representation of information within a file.

Allowed Values:

- ASCII
- BZIP2
- Base64
- GZIP
- None
- TAR
- Unicode
- ZIP

Energetic Particle Instrument — Item

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

Energetic Particles — Item

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

Energetic Solar Particle Event — Item

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

Energy — Item

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

Energy Density — Item

The amount of energy per unit volume.

Energy Flux — Item

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

Energy Range — Container

The minimum and maximum energy values of the particles represented by a given "physical parameter" description.

Sub-elements:

Bin
High
Low
Units

Ephemeris — Item

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

Equatorial Region — Item

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

Equivalent Width — Item

The spectral width of a total absorption line having the amount of absorbed radiant energy being equivalent to that in an observed absorption line.

Event — Item

An action or observation which occurs at a point in time.

Expiration Date — DateTime

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

Exposure — Duration

The time interval over which an individual measurement is taken.

Extension — Text

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.

Extreme Ultraviolet — Item

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

F-Region — Item

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

FITS — Item

Flexible Image Transport System (FITS) is a digital format primarily designed to store

scientific data sets consisting of multi-dimensional arrays (1-D spectra, 2-D images or 3-D data cubes) and 2-dimensional tables containing rows and columns of data.

Far Ultraviolet — Item

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

Faraday Cup — Item

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

Fax Number — Text

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

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:

- Field Quantity
- Frequency Range
- Qualifier

Field Quantity — Enumeration

The physical attribute of the field.

Allowed Values:

- Current
- Electric
- Electromagnetic
- Gyrofrequency
- Magnetic
- Plasma Frequency
- Potential
- Poynting Flux

Field-Aligned — Item

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

Fill Value — Text

A value that indicates that a quantity is undefined.

Fit — Item

Values that make an model agree with the data.

Flow Speed — Item

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

Flow Velocity — Item

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

Flux Feedback — Item

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

Forbush Decrease — Item

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

Format — Enumeration

The organization of data according to preset specifications. The value is selected from a list of accepted names for known, well documented formats.

Allowed Values:

- AVI
- Binary
- CDF
- CEF
- CEF 1
- CEF 2
- FITS
- GIF
- HDF
- HDF 4
- HDF 5
- HTML
- IDFS
- IDL
- JPEG
- MATLAB_4
- MATLAB_6
- MATLAB_7
- MPEG
- NCAR
- NetCDF
- PDF
- PNG
- Postscript
- QuickTime
- TIFF
- Text
- Text.ASCII
- Text.Unicode
- UDF
- VOTable
- XML

Fourier Transform Spectrograph — Item

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

Frequency — Item

The number of occurrences of a repeating event per unit time.

Frequency Range — Container

The range of possible values for the observed frequency.

Sub-elements:

- Bin
- High
- Low
- Spectral Range
- Units

Frequency-To-Gyrofrequency Ratio — Item

The ratio of the characteristic frequency of a medium to gyrofrequency of a particle.

GEI — Item

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

GEO Item

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

GIF Item

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

GSE Item

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

GSEQ Item

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

GSM Item

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

GZIP Item

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

Gamma Rays Item

Photons with a wavelength range: 0.00001 to 0.001 nm

Geiger-Mueller Tube Item

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

General Contact Item

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

Geomagnetic Storm Item

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

Granule Container

An accessible portion of another resource. A Granule may be composed of one or more physical pieces (files) which are considered 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:

- Expiration Date
- Parent ID
- Prior ID
- Release Date
- Resource ID

Source
Start Date
Stop Date

Group Item

An assemblage of values that a certain relation or common characteristic.

Gyrofrequency Item

The number of gyrations around a magnetic guiding center (field line) a charged particle makes per unit time due to the Lorentz force.

H-alpha Item

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

HAE Item

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

HCI Item

Heliographic Carrington Inertial.

HDF Item

Hierarchical Data Format

HDF 4 Item

Hierarchical Data Format, Version 4

HDF 5 Item

Hierarchical Data Format, Version 5

HEE Item

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

HEEQ Item

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

HG Item

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

HGI Item

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

HTML Item

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

Hard X-rays Item

Photons with a wavelength range: 0.001 to 0.1 nm and an energy range of 12 keV to 120 keV

Hash Function — Enumeration

A function or algorithm that converts a digital data object into a hash value. Typically the hash value is small and concise when compared to the digital data object.

Allowed Values:

MD5
SHA1
SHA256

Hash Value — Text

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

He-10830 — Item

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

He-304 — Item

A spectrum centered around the resonance line of ionised helium at 304 Angstrom (30.4 nm).

Heat Flux — Item

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

Heliosphere — Enumeration

The solar atmosphere extending roughly from the outer corona to the edge of the solar plasma at the heliopause separating primarily solar plasma from interstellar plasma.

Allowed Values:

Inner
Near Earth
Outer
Remote 1AU

High — Numeric

The largest value within a range of possible values.

Hydrodynamic — Item

Periodic or quasi-periodic oscillations of fluid quantities.

I — 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.

IDFS — Item

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

IDL — Item

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

IJ — 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.

IK — 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.

Image — Item

A two-dimensional representation of data with values at each element of the array related to an intensity or a color.

Image Intensity — Item

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

Image URL — URL

A URL to graphic, image or movie.

Imager — Item

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

Imaging Spectrometer — Item

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

Index — Sequence

The location of an item in an array or 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.

Information URL — Container

Attributes of the method of acquiring additional information.

Sub-elements:

- Description
- Language
- Name
- URL

Infrared — Item

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

Inner — Item

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

Input Resource ID — Text

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

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
- Instrument Type
- Investigation Name
- Observatory ID
- Resource Header
- Resource ID

Instrument ID — Text

The identifier of an Instrument resource.

Instrument Mode — Item

Attributes: 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.

Instrument Status — Item

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

Instrument Type — Enumeration

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

Allowed Values:

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

Integral — Enumeration

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

Allowed Values:

Area
Bandwidth
Solid Angle

Intensity — Item

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

Interferometer — Item

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

Interior — Item

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

Interplanetary Shock — Item

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

Interstellar — Item

The region between stars outside of the star's heliopause.

Investigation Name — Text

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

Ion — Item

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

Ion Chamber — 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

Ion Composition — Item

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

Ion Drift — 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.

Ionosphere — Enumeration

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

Allowed Values:

D-Region
E-Region
F-Region
Topside

Irradiance — Item

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

J — 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.

J2000 Item

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

JK 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.

JPEG Item

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

Jupiter Item

The fifth planet from the sun in our solar system.

K 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.

K-7699 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.

Keyword Text

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

LBH Band Item

Lyman-Birge-Hopfield band in the far ultraviolet range with wavelength range of 140nm to 170 nm.

LGM Item

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

Langmuir Probe Item

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

Language Text

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

Latitude Numeric

The angular distance north (positive) or south (negative) from the equator, measured along the meridian passing through the point.

Layout Item

The structured arrangement of items in a collection.

Line Depth Item

The measure of the amount of absorption below the continuum (depth) in a particular wavelength or frequency in an absorption spectrum.

Line Of Sight — Item

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

Linear — Item

Polarization where the E-field vector is confined to a given plane

Linear Scale — Item

Intervals which are equally spaced.

Location — Container

A position in space definable by a regional referencing system and geographic coordinates.

Sub-elements:

- Coordinate System Name
- Elevation
- Latitude
- Longitude
- Observatory Region

Log Scale — Item

Intervals which are spaced proportionally to the logarithms of the values being represented.

Long Wire — Item

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

Longitude — Numeric

The angular distance measured west (positive) or east (negative) from a north-south line called the Prime Meridian.

Low — Numeric

The smallest value within a range of possible values.

MAG — Item

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

MATLAB_4 — Item

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

MATLAB_6 — Item

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

MATLAB_7 — Item

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

MD5 — Item

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

MFA — Item

Magnetic Field Aligned - A coordinate system spacecraft-centered system with Z in the

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

MHD Item

Hydrodynamic waves in a magnetized plasma in which the background magnetic field plays a key role in controlling the wave propagation characteristics.

MPEG Item

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

Magnetic Item

The physical attribute attributed to a magnet or its equivalent.

Magnetic Cloud Item

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

Magnetic Field Item

A region of space near a magnetized body where magnetic forces can be detected (as measured by methods such as Zeeman splitting, etc.).

Magnetogram Item

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

Magnetometer Item

An instrument which measures the ambient magnetic field.

Magnetopause Crossing Item

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

Magnetosheath Item

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

Magnetosonic Mach Number Item

The ratio of the velocity of fast mode waves to the Alfven velocity.

Magnetosphere Enumeration

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

Allowed Values:

Magnetotail
Main
Polar
Radiation Belt

Magnetotail Item

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

Magnitude Item

A measure of the strength of a vector quantity or length of its representational vector.

Main Item

The region of the magnetosphere where the magnetic field lines are closed, but does not include

the gaseous region gravitationally bound to the body.

Mars — Item

The forth planet from the sun in our solar system.

Mass — Item

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

Mass Density — Item

The mass of particles per unit volume.

Mass Number — Item

The total number of protons and neutrons (together known as nucleons) in an atomic nucleus.

Mass Spectrometer — Item

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

Measurement Type — Enumeration

A characterization of the quantitative assessment of a phenomenon.

Allowed Values:

Activity Index
Dopplergram
Electric Field
Energetic Particles
Ephemeris
Image Intensity
Instrument Status
Ion Composition
Irradiance
Magnetic Field
Magnetogram
Neutral Atom Images
Neutral Gas
Profile
Radiance
Spectrum
Thermal Plasma
Waves
Waves.Active
Waves.Passive

Mercury — Item

The first planet from the sun in our solar system.

Mesosphere — Item

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

Metadata Contact — Item

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

Microchannel Plate — Item

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

Microwave — Item

Photons with a wavelength range: 1.00x10^6 to 1.50x10^7 nm

Mirror URL — URL

A Uniform Resource Locator (URL) to an alternate location of a resource.

Mixed — Container

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:

Mixed Quantity
Particle Type
Qualifier

Mixed Quantity — Enumeration

A characterization of the combined attributes of a quantity.

Allowed Values:

Akasofu Epsilon
Alfven Mach Number
Alfven Velocity
Frequency-To-Gyrofrequency Rat
Magnetosonic Mach Number
Other
Plasma Beta
Total Pressure
V Cross B

Mode Amplitude — Item

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

Molecule — Item

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

Moment — Item

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

Multispectral Imager — Item

An instrument which captures images at multiple spectral ranges.

NCAR — Item

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

Na-D — Item

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

Name — Text

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

Near Earth — Item

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

Near Surface — Enumeration

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

Allowed Values:

Atmosphere
Auroral Region
Equatorial Region

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

Neptune — Item

The seventh planet from the sun in our solar system.

NetCDF — Item

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

Neutral Atom Imager — Item

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

Neutral Atom Images — Item

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

Neutral Gas — Item

Measurements of neutral atomic and molecular components of a gas.

Neutral Particle Detector — Item

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

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 x 10^(-24) gram.)

Ni-6768 — Item

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

None — Item

A lack or absence of anything.

Note — Text

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

Number Density — Item

The number of particles per unit volume.

Number Flux — Item

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

Numerical Data — Container

Data product stored as numerical values in a specified format.

Sub-elements:

Access Information
Caveats
Extension
Input Resource ID
Instrument ID
Keyword
Measurement Type
Observed Region
Parameter
Processing Level
Provider Processing Level
Provider Resource Name
Provider Version
Resource Header
Resource ID
Spectral Range
Temporal Description

Observation Extent — Container

The spatial area encompassed by an observation.

Sub-elements:

Note
Observed Region
Start Location
Stop Location

Observatory — Container

The host (spacecraft, network, facility) for instruments making observations, or a family of programmatically related hosts.

Sub-elements:

Extension
Location
Observatory Group
Resource Header
Resource ID

Observatory Group — Text

A set of programmatically related observatories.

Observatory ID — Text

The identifier of an Observatory resource.

Observatory Region — Enumeration

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

Allowed Values:

Asteroid
Comet
Earth
Earth.Magnetosheath
Earth.Magnetosphere
Earth.Magnetosphere.Magnetotail
Earth.Magnetosphere.Main
Earth.Magnetosphere.Polar
Earth.Magnetosphere.Radiation Belt
Earth.Near Surface
Earth.Near Surface.Atmosphere
Earth.Near Surface.Auroral Region
Earth.Near Surface.Equatorial Region
Earth.Near Surface.Ionosphere
Earth.Near Surface.Ionosphere.D-Region
Earth.Near Surface.Ionosphere.E-Region

Earth.Near Surface.Ionosphere.F-Region
Earth.Near Surface.Ionosphere.Topside
Earth.Near Surface.Mesosphere
Earth.Near Surface.Plasmasphere
Earth.Near Surface.Polar Cap
Earth.Near Surface.South Atlantic Anomaly Region
Earth.Near Surface.Stratosphere
Earth.Near Surface.Thermosphere
Earth.Near Surface.Troposphere
Earth.Surface
Heliosphere
Heliosphere.Inner
Heliosphere.Near Earth
Heliosphere.Outer
Heliosphere.Remote 1AU
Interstellar
Jupiter
Mars
Mercury
Neptune
Pluto
Saturn
Sun
Sun.Chromosphere
Sun.Corona
Sun.Interior
Sun.Photosphere
Sun.Transition Region
Uranus
Venus

Observed By	Item

Detected or originating from another resource.

Observed Region	Enumeration

The portion of space measured by the instrument at the time of an observation. A region is distinguished by certain natural features or physical characteristics. It is the location of the observatory for in situ data, the location or region sensed by remote sensing observatories and the location-of-relevance for parameters that are derived from observational data.

Allowed Values:

Asteroid
Comet
Earth
Earth.Magnetosheath
Earth.Magnetosphere
Earth.Magnetosphere.Magnetotail
Earth.Magnetosphere.Main
Earth.Magnetosphere.Polar
Earth.Magnetosphere.Radiation Belt
Earth.Near Surface
Earth.Near Surface.Atmosphere
Earth.Near Surface.Auroral Region
Earth.Near Surface.Equatorial Region
Earth.Near Surface.Ionosphere
Earth.Near Surface.Ionosphere.D-Region
Earth.Near Surface.Ionosphere.E-Region
Earth.Near Surface.Ionosphere.F-Region
Earth.Near Surface.Ionosphere.Topside
Earth.Near Surface.Mesosphere
Earth.Near Surface.Plasmasphere
Earth.Near Surface.Polar Cap
Earth.Near Surface.South Atlantic Anomaly Region
Earth.Near Surface.Stratosphere

Earth.Near Surface.Thermosphere
Earth.Near Surface.Troposphere
Earth.Surface
Heliosphere
Heliosphere.Inner
Heliosphere.Near Earth
Heliosphere.Outer
Heliosphere.Remote 1AU
Interstellar
Jupiter
Mars
Mercury
Neptune
Pluto
Saturn
Sun
Sun.Chromosphere
Sun.Corona
Sun.Interior
Sun.Photosphere
Sun.Transition Region
Uranus
Venus

Offline	Item

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

Online	Item

Directly accessible electronically.

Open	Item

Access is granted to everyone.

Optical	Item

Photons with a wavelength range: 380 to 760 nm

Organization Name	Text

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

Other	Item

Not classified with more specific terms. The context of its usage may be described in related text.

Outer	Item

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

PDF	Item

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

PNG	Item

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

Paper	Item

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

Parallel	Item

Having the same direction as a given direction

Parameter — Container

A container of information regarding a parameter whose values are part of the product. Every product contains or can be related to one or more parameters.

Sub-elements:

- Cadence
- Caveats
- Coordinate System
- Description
- Field
- Fill Value
- Mixed
- Name
- Parameter Key
- Particle
- Rendering Hints
- Set
- Structure
- Support
- Units
- Units Conversion
- Valid Max
- Valid Min
- Wave

Parameter Key — Text

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.

Parent ID — Text

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

Part Of — Item

A portion of a larger resource.

Particle — Container

A description of the types of particles observed in the measurement. This includes both direct observations and inferred observations.

Sub-elements:

- Atomic Number
- Azimuthal Angle Range
- Energy Range
- Particle Quantity
- Particle Type
- Polar Angle Range
- Qualifier

Particle Correlator — Item

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

Particle Detector — Item

An instrument which detects particle flux!!!

Particle Quantity — Enumeration

A characterization of the physical properties of the particle.

Allowed Values:

- Arrival Direction
- Atomic Number Detected
- Average Charge State
- Charge State
- Count Rate

Counts
Energy
Energy Density
Energy Flux
Flow Speed
Flow Velocity
Gyrofrequency
Heat Flux
Mass
Mass Density
Mass Number
Number Density
Number Flux
Phase-Space Density
Plasma Frequency
Pressure
Sonic Mach Number
Sound Speed
Temperature
Thermal Speed
Velocity

Particle Type — Enumeration

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

Allowed Values:

Aerosol
Alpha Particle
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.

Person — Container

An individual human being.

Sub-elements:

Address
Email
Extension
Fax Number
Organization Name
Person Name
Phone Number
Release Date
Resource ID

Person ID — Text

The identifier assigned to a Person description.

Person Name — Text

The words used to address an individual.

Perturbation — Item

Variations in the state of a system.

Phase — Item

A point or portion in a recurring series of changes.

Phase Angle — Item

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

Phase-Space Density — Item

The number of particles per unit volume in the six-dimensional space of position and velocity.

Phenomenon Type — Enumeration

The characteristics or categorization of an event type.

Allowed Values:

- Active Region
- Aurora
- Bow Shock Crossing
- Coronal Hole
- Coronal Mass Ejection
- EIT Wave
- Energetic Solar Particle Event
- Forbush Decrease
- Geomagnetic Storm
- Interplanetary Shock
- Magnetic Cloud
- Magnetopause Crossing
- Radio Burst
- Solar Flare
- Solar Wind Extreme
- Stream Interaction Region
- Substorm

Phone Number — Text

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

Photometer — Item

An instrument which measures the strength of electromagnetic radiation within a spectral band which can range from ultraviolet to infrared and includes the visible spectrum.

Photon — Item

Electromagnetic waves detected by techniques that utilize their corpuscular character (e.g., CCD, CMOS, photomultipliers).

Photopolarimeter — Item

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

Photosphere — Item

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

Plasma Beta — Item

The ratio of the plasma pressure (nkT) to the magnetic pressure (B^2/2mu0) of the SUM(nkT)/(B^2/2mu0).

Plasma Frequency — Item

A number-density-dependent characteristic frequency of a plasma.

Plasma Waves — Item

Self-consistent collective oscillations of particles and fields (electric and magnetic) in a plasma.

Plasmagram — Item

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.

Plasmasphere — Item

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

Platform — Item

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.

Pluto — Item

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

Polar — Item

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

Polar Angle — Item

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).

Polar Angle Range — Container

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

Sub-elements:

Bin
High
Low
Units

Polar Cap — Item

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

Polarization — Item

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

Positional — Item

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

Postscript — Item

A page description programming language created by Adobe Systems Inc. that is a

device-independent industry standard for representing text and graphics.

Potential — Item

A field which obeys Laplace's Equation.

Poynting Flux — Item

Electromagnetic energy flux transported by a wave characterized as the rate of energy transport per unit area per steradian.

Pressure — Item

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

Principal Investigator — Item

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

Prior ID — Text

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

Probable — Item

Likely given the available evidence. Considered in the range of 4-7 on a scale of 0-10.

Processing Level — Enumeration

The standard classification of the processing performed on the product.

Allowed Values:

Calibrated
Raw
Uncalibrated

Profile — Item

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

Project Scientist — Item

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

Projection — Enumeration

A measure of the length of a position or measured vector as projected into a plane of the coordinate system.

Allowed Values:

IJ
IK
JK

Propagation Time — Item

Time difference between transmission and reception of a wave in an active wave experiment.

Proportional Counter — Item

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

Proton — Item

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

Provider Processing Level — Text

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

Provider Resource Name — Text

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

Provider Version — Text

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

Pseudo — Item

Similar to or having the appearance of something else. Can be used to indicate an estimation or approximation of a particular quantity.

Publisher — Item

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

Quadrispherical Analyser — Item

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

Qualifier — Enumeration

Characterizes the refinement to apply to a type or attribute of a quantity.

Allowed Values:

Anisotropy
Array
Average
Characteristic
Circular
Column
Component
Component.I
Component.J
Component.K
Cross Spectrum
Deviation
Differential
Direction
Direction Angle
Direction Angle.Azimuth Angle
Direction Angle.Elevation Angle
Direction Angle.Polar Angle
Field-Aligned
Fit
Group
Integral
Integral.Area
Integral.Bandwidth
Integral.Solid Angle
Line Of Sight
Linear
Magnitude
Moment
Parallel
Peak
Perpendicular
Perturbation
Phase
Phase Angle
Projection
Projection.IJ
Projection.IK
Projection.JK
Pseudo
Ratio
Scalar
Spectral

Standard Deviation
Stoke's Parameters
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. R (radial) axis is radially away from the Sun, T (tangential) axis is normal to the plane formed by R and the Sun's spin vector, positive in the direction of planetary motion. N (normal) is R x T.

Radar — Item

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

Radiance — Item

A radiometric measurement that 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. The SI unit of radiance is watts per steradian per square meter (W*s*r^-1*m^-2).

Radiation Belt — Item

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

Radio Burst — Item

Emissions of the sun in radio wavelengths from centimeters to dekameters, under both quiet and disturbed conditions. Radio Bursts can be "Type I" consisting of many short, narrow-band bursts in the metric range (300 - 50 MHz).; "Type II" 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).

Radio Frequency — Item

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

Radiometer — Item

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

Ratio — Item

The relative magnitudes of two quantities.

Raw — Item

Data in its original state with no processing to account for calibration!!!

Registry — Container

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

Relative Stop Date — Duration

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

Release Date — DateTime

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

Remote 1AU — Item

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

Rendering Hints — Container

Attributes to aid in the rendering of parameter.
Sub-elements:
Axis Label
Display Type
Scale Max
Scale Min
Scale Type
Value Format

Repository — Container

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

Repository ID — Text

The identifier of an Repository resource.

Resonance Sounder — Item

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

Resource Header — Container

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

Resource ID — Text

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

Resource Name — Text

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

Restricted — Item

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

Retarding Potential Analyser — Item

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

Revision Of — Item

A modified version of a resource instance.

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:

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

SC — Item

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

SE — Item

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

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.

Saturn — Item

The sixth planet from the sun in our solar system.

Scalar — Item

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

Scale Max — Numeric

The maximum value that the variable is expected to attain. Used, for example, by automated plotting software.

Scale Min — Numeric

The minimum value that the variable is expected to attain. Used, for example, by automated plotting software.

Scale Type — Enumeration

The scaling to apply to an axis. If this attribute is not present, linear scale should be assumed.

Allowed Values:

Linear Scale
Log Scale

Scientist — Item

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

Scintillation Detector — Item

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

Search Coil — 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.

Service — Container

A location or facility that can perform a well defined task.

Sub-elements:

Access URL
Extension
Resource Header
Resource ID

Set — Text

A collection of items for a particular purpose.

Size	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^n.

Soft X-Rays	Item

X-Rays with an energy range of 0.12 keV to 12 keV.

Solar Flare	Item

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

Solar Wind Extreme	Item

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

Solid Angle	Item

Integration over the angle in three-dimensional space that an object subtends at a point.

Sonic Mach Number	Item

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

Sound Speed	Item

The speed at which sound travels through a medium.

Sounder	Item

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

Source	Containound Speonal space

spacecraft, Z is normal to this plane and Y completes the triad in a right-handed coordinate system.

Spacecraft Potential Control — Item

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

Spase — Container

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

Sub-elements:

- Annotation
- Catalog
- Display Data
- Document
- Granule
- Instrument
- Numerical Data
- Observatory
- Person
- Registry
- Repository
- Service
- Version

Spectral — Item

Characterized as a range or continuum of frequencies

Spectral Power Receiver — Item

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

Spectral Range — Enumeration

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

Allowed Values:

- Ca-K
- Extreme Ultraviolet
- Far Ultraviolet
- Gamma Rays
- H-alpha
- Hard X-rays
- He-10830
- He-304
- Infrared
- K-7699
- LBH Band
- Microwave
- Na-D
- Ni-6768
- Optical
- Radio Frequency
- Soft X-Rays
- Ultraviolet
- White-Light
- X-Rays

Spectrogram — Item

The characterization of signal strengths as a function of frequency (or energy) and time.

Spectrometer — Item

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 {[SQRT(i^2+j^2)]/k}, or an elevation angle, arctan [k/SQRT (i^2+j^2)].

Stack Plot	Item

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

Standard Deviation	Item

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

Start Date	DateTime

The specification of a starting point in time.

Start Location	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.

Stop Date	DateTime

The specification of a stopping point in time.

Stop Location	Text

The final position in space.

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.

Stream Interaction Region	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

Substorm	Item

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

Sun	Enumeration

The star upon which our solar system is centered.

Allowed Values:

Chromosphere
Corona
Interior
Photosphere
Transition Region

Support — Container

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

Sub-elements:

Qualifier
Support Quantity

Support Quantity — Enumeration

A characterization of the support information.

Allowed Values:

Instrument Mode
Other
Positional
Temporal
Velocity

Surface — Item

The outermost area of a solid object.

Symmetric — Item

Equal distribution about one or more axes.

TAR — Item

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

TIFF — Item

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

Team Leader — Item

An individual who is the designated leader of an investigation.

Team Member — Item

An individual who is a major participant in an investigation.

Technical Contact — Item

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

Temperature — Item

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

Temporal — Item

Pertaining to time.

Temporal Description — Container

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

Sub-elements:

Cadence
Exposure
Time Span

Tensor — Item

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

Text — Enumeration

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

Allowed Values:

ASCII
Unicode

Thermal Plasma — Item

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

Thermal Speed — Item

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

Thermosphere — Item

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

Thumbnail — Item

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

Time Of Flight — Item

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

Time Series — Item

A representation of data showing a set of observations taken at different points in time and charted as a time series.

Time Span — Container

The duration of an interval in time.

Sub-elements:

Note
Relative Stop Date
Start Date
Stop Date

Topside — Item

The region at the upper most areas of the ionosphere.

Total — Item

The summation of quantities over all possible species.

Total Pressure — Item

In an MHD fluid it is the number density (N) times Boltzmann constant times the temperature in Kelvin.

Trace — Item

The sum of the elements on the main diagonal (the diagonal from the upper left to the lower right) of a square matrix.

Transition Region — Item

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

Troposphere	Item

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

UDF	Item

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

URL	Text

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

Ultraviolet	Item

Photons with a wavelength range: 10 to 400 nm.

Uncalibrated	Item

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

Uncertainty	Item

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

Unicode	Item

Text in multi-byte Unicode format.

Units	Text

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

Units Conversion	Text

The multiplicative factor for converting a unit into International System of Units (SI) units. The factor is expressed in the form "number > x", where "number" is a numerical value and "x" is the appropriate SI units. The basic SI units are Enumerated: m (meter), N (newton), kg (kilogram), Pa (pascal), s (second), Hz (hertz), A (ampere), V (volt), K (kelvin), W (watt), rad (radian), J (joule), sr (steradian), C (coulomb), T (tesla), ohm (ohm), mho (mho or seimens), H (henry), and F (farad). Two useful units which are not SI units are: degree (angle), and unitless (no units). An example is: "1.0E-5>T" which converts the units, presumable nT, to tesla. Another example is: "1.0e+3>m/s" which converts a velocity expressed in kilometers per second to meters per second.

Unlikely	Item

Not likely given the available evidence. Considered in the range of 0 on a scale of 0-10.

Unspecified	Item

A value which is not provided.

Uranus	Item

The eighth planet from the sun in our solar system.

V Cross 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.

VOTable — Item

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

Valid Max — Text

The largest legitimate value.

Valid Min — Text

The smallest legitimate value.

Value Format — 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.

Variance — Item

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

Vector — Item

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

Velocity — Item

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

Venus — Item

The second planet from the sun in our solar system.

Version — Text

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

WGS84 — Item

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

Wave — Container

Periodic or quasi-periodic (AC) variations of physical quantities in time and space, capable of propagating or being trapped within particular regimes.

Sub-elements:

- Energy Range
- Frequency Range
- Qualifier
- Wave Quantity
- Wave Type
- Wavelength Range

Wave Form — Item

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

Wave Quantity — Enumeration

A characterization of the physical properties of a wave.

Allowed Values:

- AC-Electric Field
- AC-Magnetic Field
- Absorption
- Doppler Frequency
- Emissivity
- Energy Flux
- Equivalent Width
- Frequency
- Gyrofrequency
- Intensity
- Line Depth
- Magnetic Field
- Mode Amplitude
- Plasma Frequency
- Polarization
- Poynting Flux
- Propagation Time
- Stoke's Parameters
- Velocity
- Wavelength

Wave Type — Enumeration

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

Allowed Values:

- Electromagnetic
- Electrostatic
- Hydrodynamic
- MHD
- Photon
- Plasma Waves

Waveform Receiver — Item

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

Wavelength — Item

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

Wavelength Range — Container

The range of possible values for the observed wavelength.

Sub-elements:

- Bin
- High
- Low
- Spectral Range
- Units

Waves — Enumeration

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

Weak	Item

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

White-Light	Item

Photons with a wavelength in the visible range for humans.

X-Rays	Item

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

XML	Item

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

ZIP	Item

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

8. Enumeration of Selected Quantities

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

Access Rights List — 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.
Restricted	Access to the product is regulated and requires some form of identification.

Annotation Type 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.

Association Type List — Closed

Identifiers for resource associations.

Term	Definition
Child Event Of	A descendant or caused by another resource.
Derived From	A transformed or altered version of a resource instance.
Observed By	Detected or originating from another resource.
Other	Not classified with more specific terms. The context of its usage may be described in related text.
Part Of	A portion of a larger resource.
Revision Of	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.

Classification Method 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.

Confidence Rating 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.

Coordinate Representation 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)].

Coordinate System Name 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 <http://nssdc.gsfc.nasa.gov/space/cgm/cgmm_des.html>
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 <http://cdpp.cnes.fr/00428.pdf>
GEI	Geocentric Equatorial Inertial - A coordinate system where the Z axis is along Earth's spin vector, positive northward. X axis points towards the first point of Aries (from the Earth towards the Sun at the vernal equinox). See Russell, 1971
GEO	Geographic - geocentric corotating - A coordinate system where the Z axis is along Earth's spin vector, positive northward. X axis lies in Greenwich meridian, positive towards Greenwich. See Russell, 1971.
GSE	Geocentric Solar Ecliptic - A coordinate system where the X axis is from Earth to Sun. Z axis is normal to the ecliptic, positive northward. See Russell, 1971.
GSEQ	Geocentric Solar Equatorial - A coordinate system where the X axis is from Earth to Sun. Y axis is parallel to solar equatorial plane. Z axis is positive northward. See Russell, 1971
GSM	Geocentric Solar Magnetospheric - A coordinate system where the X axis is from Earth to Sun, Z axis is northward in a plane containing the X axis and the geomagnetic dipole axis. See Russell, 1971
HAE	Heliocentric Aries Ecliptic - A coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis is positive towards the first point of Aries (from Earth to Sun at vernal equinox). Same as SE

	below. See Hapgood, 1992.
HCI	Heliographic Carrington Inertial.
HEE	Heliocentric Earth Ecliptic - A coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis points from Sun to Earth. See Hapgood, 1992
HEEQ	Heliocentric Earth Equatorial - A coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X axis is generally Earthward in the plane defined by the Z axis and the Sun-Earth direction. See Hapgood, 1992.
HG	Heliographic - A heliocentric rotating coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X, Y axes rotate with a 25.38 day period. The zero longitude (X axis) is defined as the longitude that passed through the ascending node of the solar equator on the ecliptic plane on 1 January, 1854 at 12 UT. See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>
HGI	Heliographic Inertial - A heliocentric coordinate system where the Z axis is normal to the solar equatorial plane, positive northward. X axis is along the intersection line between solar equatorial and ecliptic planes. The X axis was positive at SE longitude of 74.367 deg on Jan 1, 1900. (See SE below.) See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>
J2000	An astronomical coordinate system which uses the mean equator and equinox of Julian date 2451545.0 TT (Terrestrial Time), or January 1, 2000, noon TT. (aka J2000) to define a celestial reference frame.
LGM	Local Geomagnetic - A coordinate system used mainly for Earth surface or near Earth surface magnetic field data. X axis northward from observation point in a geographic meridian. Z axis downward towards Earth's center. In this system, H (total horizontal component) = SQRT (Bx^2 + By^2) and D (declination angle) = arctan (By/Bx)
MAG	Geomagnetic - geocentric. Z axis is parallel to the geomagnetic dipole axis, positive north. X is in the plane defined by the Z axis and the Earth's rotation axis. If N is a unit vector from the Earth's center to the north geographic pole, the signs of the X and Y axes are given by Y = N x Z, X = Y x Z.. See Russell, 1971, and <http://cdpp.cnes.fr/00428.pdf>
MFA	Magnetic Field Aligned - A coordinate system spacecraft-centered system with Z in the direction of the ambient magnetic field vector. X is in the plane defined by Z and the spacecraft-Sun line, positive sunward. See <http://cdpp.cnes.fr/00428.pdf>
RTN	Radial Tangential Normal. Typically centered at a spacecraft. Used for IMF and plasma V vectors. R

	(radial) axis is radially away from the Sun, T (tangential) axis is normal to the plane formed by R and the Sun's spin vector, positive in the direction of planetary motion. N (normal) is R x T.
SC	Spacecraft - A coordinate system defined by the spacecraft geometry and/or spin. Often has Z axis parallel to spacecraft spin vector. X and Y axes may or may not corotate with the spacecraft. See SR and SR2 below.
SE	Solar Ecliptic - A heliocentric coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis is positive towards the first point of Aries (from Earth to Sun at vernal equinox). Same as HAE above. See <http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html>
SM	Solar Magnetic - A geocentric coordinate system where the Z axis is northward along Earth's dipole axis, X axis is in plane of z axis and Earth-Sun line, positive sunward. See Russell, 1971.
SR	Spin Reference - A special case of a Spacecraft (SC) coordinate system for a spinning spacecraft. Z is parallel to the spacecraft spin vector. X and Y rotate with the spacecraft. See <http://cdpp.cnes.fr/00428.pdf>
SR2	Spin Reference 2 - A special case of a Spacecraft (SC) coordinate system for a spinning spacecraft. Z is parallel to the spacecraft spin vector. X is in the plane defined by Z and the spacecraft-Sun line, positive sunward. See <http://cdpp.cnes.fr/00428.pdf>
SSE	Spacecraft Solar Ecliptic - A coordinate system used for deep space spacecraft, for example Helios. - X axis from spacecraft to Sun. Z axis normal to ecliptic plane, positive northward. Note: Angle between normals to ecliptic and to Helios orbit plane ~ 0.25 deg.
Spacecraft Orbit Plane	A coordinate system where X lies in the 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.
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.

Direction Angle List — Closed

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

Term	Definition
Azimuth Angle	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).
Elevation Angle	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)).

Polar Angle	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).

Display Type 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.
Stack Plot	A representation of data showing multiple sets of observations on a single plot, possibly offsetting each plot by some uniform amount.
Time Series	A representation of data showing a set of observations taken at different points in time and charted as a time series.
Wave Form	Spatial or temporal variations of wave amplitude over wave-period timescales.

Document Type List — Closed

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

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

Earth List — Closed

Identifiers for the regions surrounding the Earth.

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

Encoding List — Closed

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 <http://www.bzip.org/>
Base64	A data encoding scheme whereby binary-encoded data is converted to printable ASCII characters. It is defined as a MIME content transfer encoding for use in Internet e-mail. The only characters used are the upper- and lower-case Roman alphabet characters (A–Z, a–z), the numerals (0–9), and the "+" and "/" symbols, with the "=" symbol as a special suffix (padding) code.
GZIP	An open standard algorithm distributed by GHU based on LZ77 and Huffman coding. See <http://www.gnu.org/software/gzip/gzip.html> or <http://www.gzip.org/>
None	A lack or absence of anything.
TAR	A file format used to collate collections of files into one larger file, for distribution or archiving, while preserving file system information such as user and group permissions, dates, and directory structures. The format was standardized by POSIX.1-1988 and later POSIX.1-2001.
Unicode	Text consisting of 8-bit Unicode characters.
ZIP	An open standard for compression which is a variation of the LZW method and was originally used in the PKZIP utility.

Field Quantity List — Closed

Identifiers for the physical attribute of the field.

Term	Definition
Current	

per steradian.

Format List — Closed

Identifiers for data organized according to preset specifications.

Term	Definition
AVI	Audio Video Interleave (AVI) a digital format for movies that conforms to the Microsoft Windows Resource Interchange File Format (RIFF).
Binary	A direct representation of the bits which may be stored in memory on a computer.
CDF	Common Data Format (CDF). A binary storage format developed at Goddard Space Flight Center (GSFC).
CEF	Cluster Exchange Format (CEF) is a self-documenting ASCII format designed for the exchange of data. There are two versions of CEF which are not totally compatible.
CEF 1	Cluster Exchange Format (CEF), version 1, is a self-documenting ASCII format designed for the exchange of data. The metadata contains information compatible with the ISTP recommendations for CDF.
CEF 2	Cluster Exchange Format (CEF), version 2, is a self-documenting ASCII format designed for the exchange of data and introduced for Cluster Active Archive. Compared to version 1, the metadata description of vectors and tensors is different.
FITS	Flexible Image Transport System (FITS) is a digital format primarily designed to store scientific data sets consisting of multi-dimensional arrays (1-D spectra, 2-D images or 3-D data cubes) and 2-dimensional tables containing rows and columns of data.
GIF	Graphic Interchange Format (GIF) first introduced in 1987 by CompuServe. GIF uses LZW compression and images are limited to 256 colours.
HDF	Hierarchical Data Format
HDF 4	Hierarchical Data Format, Version 4
HDF 5	Hierarchical Data Format, Version 5
HTML	A text file containing structured information represented in the HyperText Mark-up Language (HTML). See <http://www.w3.org/MarkUp/>
IDFS	Instrument Data File Set (IDFS) is a set of files written in a prescribed format which contain data, timing data, and meta-data. IDFS was developed at Southwest Research Institute (SwRI).
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
MATLAB_4	MATLAB Workspace save set, version 4. MAT-files are double-precision, binary, MATLAB format files. MATLAB is a proprietary product of The MathWorks.

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

Hash Function List

Closed

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

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

	publication 180-1.
SHA256	Secure Hash Algorithm (SHA), a 256-bit message digest algorithm developed by the NSA and described in Federal Information Processing Standard (FIPS) publication 180-1.

Heliosphere List Closed

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

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

Instrument Type List Closed

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

Term	Definition
Antenna	A sensor used to measure electric potential.
Channeltron	An instrument that detects electrons, ions, and UV-radiation, according to the principle of a secondary emission multiplier. It is typically used in electron spectroscopy and mass spectrometry.
Coronograph	An instrument which can image things very close to the Sun by using a disk to block the Sun's bright surface which reveals the faint solar corona and other celestial objects.
Double Sphere	A dipole antenna of which the active (sensor) elements are small spheres located at the ends of two wires deployed in the equatorial plane, on opposite sides of a spinning spacecraft.
Dust Detector	An instrument which determines the mass and speed of ambient dust particles.
Electron Drift Instrument	An active experiment to measure the electron drift velocity based on sensing the displacement of a weak beam of electrons after one gyration in the ambient magnetic field.
Electrostatic Analyser	An instrument which uses charged plates to analyze the mass, charge and kinetic energies of charged particles which enter the instrument.
Energetic Particle Instrument	An instrument that measures fluxes of charged particles as a function of time, direction of motion, mass, charge and/or species.
Faraday Cup	An instrument consisting of an electrode from which

	electrical current is measured while a charged particle beam (electrons or ions) impinges on it. Used to determine energy spectrum and sometimes ion composition of the impinging particles.
Flux Feedback	A search coil whose bandwidth and signal/noise ratio are increased by the application of negative feedback at the sensor (flux) level by driving a collocated coil with a signal from the preamplifier.
Fourier Transform Spectrograph	An instrument that determines the spectra of a radiative source, using time-domain measurements and a Fourier transform.
Geiger-Mueller Tube	An instrument which measures density of ionizing radiation based on interactions with a gas.
Imager	An instrument which samples the radiation from an area at one or more spectral ranges emitted or reflected by an object.
Imaging Spectrometer	An instrument which is a multispectral scanner with a very large number of channels (64-256 channels) with very narrow band widths.
Interferometer	An instrument to study the properties of two or more waves from the pattern of interference created by their superposition.
Ion Chamber	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
Ion Drift	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.
Langmuir Probe	A monopole antenna associated with an instrument. The instrument applies a potential to the antenna which is swept to determine the voltage/current characteristic. This provides information about the plasma surrounding the probe and spacecraft.
Long Wire	A dipole antenna whose active (sensor) elements are two wires deployed in the equatorial plane on opposite sides of a spinning spacecraft, and whose length is several times greater than the spacecraft diameter.
Magnetometer	An instrument which measures the ambient magnetic field.
Mass Spectrometer	An instrument which distinguishes chemical species in terms of their different isotopic masses.
Microchannel Plate	An instrument used for the detection of elementary particles, ions, ultraviolet rays and soft X-rays constructed from very thin conductive glass capillaries.
Multispectral Imager	An instrument which captures images at multiple spectral ranges.
Neutral Atom Imager	An instrument which measures the quantity and properties of neutral particles over a range of angles. Measured properties can include mass and energy.
Neutral Particle Detector	An instrument which measures the quantity and

	properties of neutral particles. Measured properties can include mass and plasma bulk densities.
Particle Correlator	An instrument which correlates particle flux to help identify wave/particle interactions.
Particle Detector	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.
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.
Proportional Counter	An instrument which measures energy of ionization radiation based on interactions with a gas.
Quadrispherical Analyser	An instrument used for the 3-D detection of plasma, energetic electrons and ions, and for positive-ion composition measurements.
Radar	An instrument that uses directional properties of returned power to infer spatial and/or other characteristics of a remote object.
Radiometer	An instrument for detecting or measuring radiant energy. Radiometers are commonly limited to infrared radiation.
Resonance Sounder	A combination of a radio receiver and a pulsed transmitter used to study the plasma surrounding a spacecraft by identifying resonances or cut-offs (of the wave dispersion relation), whose frequencies are related to the ambient plasma density and magnetic field. When the transmitter is off it is essentially a high frequency-resolution spectral power receiver.
Retarding Potential Analyser	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.
Scintillation Detector	An instrument which detects flouresences of a material which is excited by high energy (ionizing) electromagnetic or charged particle radiation.
Search Coil	An instrument which measures the time variation of the magnetic flux threading a loop by measurement of the electric potential difference induced between the ends of the wire.
Sounder	An instrument which measures the radiances from an object. A sounder may measure radiances at multiple spectral ranges.
Spacecraft Potential Control	An instrument to control the electric potential of a

	spacecraft with respect to the ambient plasma by emitting a variable current of positive ions.
Spectral Power Receiver	A radio receiver which determines the power spectral density of the electric or magnetic field, or both, at one or more frequencies.
Spectrometer	An instrument that measures the component wavelengths of light (or other electromagnetic radiation) by splitting the light up into its component wavelengths.
Time Of Flight	An instrument which measures the time it takes for a particle to travel between two detectors.
Unspecified	A value which is not provided.
Waveform Receiver	A radio receiver which outputs the value of one or more components of the electric and/or magnetic field as a function of time.

Integral List — 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.
Solid Angle	Integration over the angle in three-dimensional space that an object subtends at a point.

Ionosphere List — Closed

Identifiers for ionospheric regions.

Term	Definition
D-Region	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.
E-Region	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.
F-Region	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.

Magnetosphere List — Closed

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

Term	Definition
Magnetotail	The region on the night side of the body where the magnetic filed is stretched backwards by the force of the solar wind. For Earth, the magnetotail begins at a

	night-side radial distance of 10 Re (X > -10Re).
Main	The region of the magnetosphere where the magnetic field lines are closed, but does not include the gaseous region gravitationally bound to the body.
Polar	The region near the pole of a body. For a magnetosphere the polar region is the area where magnetic field lines are open and includes the auroral zone.
Radiation Belt	The region within a magnetosphere where high-energy particles could potentially be trapped in a magnetic field.

Measurement Type List Closed

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

Term	Definition
Activity Index	An indication, derived from one or more measurements, of the level of activity of an object or region, such as sunspot number, F10.7 flux, Dst, or the Polar Cap Indices.
Dopplergram	A map or image depicting the spatial distribution of line-of-sight velocities of the observed object.
Electric Field	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.
Energetic Particles	Pieces of matter that are moving very fast. Energetic particles include protons, electrons, neutrons, neutrinos, the nuclei of atoms, and other sub-atomic particles.
Ephemeris	The spatial coordinates of a body as a function of time. When used as an Instrument Type it represents the process or methods used to generate spatial coordinates.
Image Intensity	Measurements of the two-dimensional distribution of the intensity of photons from some region or object such as the Sun or the polar auroral regions; can be in any wavelength band, and polarized, etc.
Instrument Status	A quantity directly related to the operation or function of an instrument.
Ion Composition	In situ measurements of the relative flux or density of electrically charged particles in the space environment. May give simple fluxes, but full distribution functions are sometimes measured.
Irradiance	A radiometric term for the power of electromagnetic radiation at a surface, per unit area. "Irradiance" is used when the electromagnetic radiation is incident on the surface. The SI unit of irradiance is watts per square meter (W·m-2).
Magnetic Field	A region of space near a magnetized body where magnetic forces can be detected (as measured by methods such as Zeeman splitting, etc.).
Magnetogram	Measurements of the vector or line-of-sight magnetic field determined from remote sensing measurements of

	the detailed structure of spectral lines, including their splitting and polarization. ("Magnetogram.")
Neutral Atom Images	Measurements of neutral atom fluxes as a function of look direction; often related to remote energetic charged particles that lose their charge through charge-exchange and then reach the detector on a line-of-sight trajectory.
Neutral Gas	Measurements of neutral atomic and molecular components of a gas.
Profile	Measurements of a quantity as a function of height above an object such as the limb of a body.
Radiance	A radiometric measurement that 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. The SI unit of radiance is watts per steradian per square meter (W*s*r^-1*m^-2).
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.
Thermal Plasma	Measurements of the plasma in the energy regime where the most of the plasma occurs. May be the basic fluxes in the form of distribution functions or the derived bulk parameters (density, flow velocity, etc.).
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.

Mixed Quantity List — Closed

Identifiers for the combined attributes of a mixed parameter quantity.

Term	Definition
Akasofu Epsilon	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^2sin(theta/2)^4 where B is the IMF, l is an empirical scaling parameter equal to 7 RE, and theta = tan(BY /BZ)^-1 the IMF clock angle.
Alfven Mach Number	The ratio of the bulk flow speed to the Alfven speed.
Alfven Velocity	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).
Magnetosonic Mach Number	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.
Plasma Beta	The ratio of the plasma pressure (nkT) to the magnetic pressure (B^2/2mu0) of the SUM(nkT)/(B^2/2mu0).
Total Pressure	In an MHD fluid it is the number density (N) times Boltzmann constant times the temperature in Kelvin.
V Cross B	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.

Near Surface List — Closed

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

Term	Definition
Atmosphere	The neutral gases surrounding a body that extends from the surface and is bound to the body by virtue of the gravitational attraction.
Auroral Region	The region in the atmospheric where electrically-charged particles bombarding the upper atmosphere of a planet in the presence of a magnetic field produce an optical phenomenon.
Equatorial Region	A region centered on the equator and limited in latitude by approximately 23 degrees north and south of the equator.
Ionosphere	The charged or ionized gases surrounding a body that are nominally bound to the body by virtue of the gravitational attraction.
Mesosphere	The layer of the atmosphere that extends from the Stratosphere to a range of 80 km to 85 km, temperature decreasing with height.
Plasmasphere	A region of the magnetosphere consisting of low energy (cool) plasma. It is located above the ionosphere. The outer boundary of the plasmasphere is known as the plasmapause, which is defined by an order of magnitude drop in plasma density.
Polar Cap	The areas of the globe surrounding the poles and consisting of the region north of 60 degrees north latitude an the region south of 60 degrees south latitude.
South Atlantic Anomaly Region	The region where 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.

Particle Quantity List — Closed

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

Term	Definition
Arrival Direction	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.
Atomic Number Detected	The number of protons in the nucleus of an atom as determined by a detector.
Average Charge State	A measure of the composite deficit (positive) or excess (negative) of electrons with respect to protons.
Charge State	Charge of a fully or partially stripped ion, in units of the charge of a proton. Charge state of a bare proton = 1.
Count Rate	The number of events per unit time.
Counts	An enumeration of the number of detection events occurring in a particle detector per unit time or over detector accumulation times.
Energy	The capacity for doing work as measured by the capability of doing work (potential energy) or the conversion of this capability to motion (kinetic energy)
Energy Density	The amount of energy per unit volume.
Energy Flux	The amount of energy passing through a unit area in a unit time.
Flow Speed	The rate at which particles or energy is passing through a unit area in a unit time.
Flow Velocity	The volume of matter passing through a unit area perpendicular to the direction of flow in a unit of 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.
Heat Flux	Flow of thermal energy through a gas or plasma; typically computed as third moment of a distribution function.
Mass	The measure of inertia (mass) of individual objects (e.g., aerosols).
Mass Density	The mass of particles per unit volume.
Mass Number	The total number of protons and neutrons (together known as nucleons) in an atomic nucleus.
Number Density	The number of particles per unit volume.
Number Flux	The number of particles passing through a unit area in a unit time.
Phase-Space Density	The number of particles per unit volume in the six-dimensional space of position and velocity.
Plasma Frequency	A number-density-dependent characteristic frequency of a plasma.
Pressure	The force per unit area exerted by a particle distribution or field.

Sonic Mach Number	The ratio of the bulk flow speed to the speed of sound in the medium.
Sound Speed	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).
Thermal Speed	For a Maxwellian distribution, the difference between the mean speed and the speed within which ~69% (one sigma) of all the members of the speed distribution occur.
Velocity	Rate of change of position. Also used for the average velocity of a collection of particles, also referred to as "bulk velocity".

Particle Type List — Closed

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

Term	Definition
Aerosol	A suspension of fine solid or liquid particles in a gas.
Alpha Particle	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 x 10^(-19) Coulomb and having a mass when at rest of about 9.109534 x 10^(-28) gram.
Ion	An atom that has acquired a net electric charge by gaining or losing one or more electrons.(Note: Z>2)
Molecule	A group of atoms so united and combined by chemical affinity that they form a complete, integrated whole, being the smallest portion of any particular compound that can exist in a free state
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 x 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 x 10^(-24) gram.

Phenomenon Type List — Closed

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

Term	Definition
Active Region	A localized, transient volume of the solar atmosphere in which PLAGEs, SUNSPOTS, FACULAe, FLAREs, etc. may be observed.
Aurora	An atmospheric phenomenon consisting of bands of light caused by charged solar particles following the earth's magnetic lines of force.

Bow Shock Crossing	A crossing of the boundary between the undisturbed (except for foreshock effects) solar wind and the shocked, decelerated solar wind of the magnetosheath.
Coronal Hole	An extended region of the corona, exceptionally low in density and associated with unipolar photospheric regions. A coronal hole can be an "open" magnetic field in the corona and (perhaps) inner heliosphere which has a faster than average outflow (wind); A region of lower than "quiet" ion and electron density in the corona; or a region of lower peak electron temperature in the corona than in the "quiet" corona.
Coronal Mass Ejection	A solar event (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).
EIT Wave	A wave in the corona of the Sun which produce shock waves on the Sun’s chromosphere (Moreton Waves). EIT Waves are produced by large solar flare and expand outward at about 1,000 km/s. It usually appears as a slowly moving diffuse arc of brightening in H-alpha, and may travel for several hundred thousand km.
Energetic Solar Particle Event	An enhancement of interplanetary fluxes of energetic ions accelerated by interplanetary shocks and/or solar flares.
Forbush Decrease	A rapid decrease in the observed galactic cosmic ray intensity following the passage of an outwardly convecting interplanetary magnetic field disturbance, such as those associated with large CME's, that sweep some galactic cosmic rays away from Earth.
Geomagnetic Storm	A magnetospheric disturbance typically defined by variations in the horizontal component of the Earth's surface magnetic field. The variation typically starts with a field enhancement associated with a solar wind pressure pulse and continues with a field depression associated with an enhancement of the diamagnetic magnetospheric ring current.
Interplanetary Shock	A shock propagating generally anti-sunward through the slower solar wind, often seen in front of CME-associated plasma clouds.
Magnetic Cloud	A transient event observed in the solar wind characterized as a region of enhanced magnetic field strength, smooth rotation of the magnetic field vector and low proton density and temperature.
Magnetopause Crossing	A crossing of the interface between the shocked solar wind in the magnetosheath and the magnetic field and plasma in the magnetosphere.
Radio Burst	Emissions of the sun in radio wavelengths from centimeters to dekameters, under both quiet and disturbed conditions. Radio Bursts can be "Type I" consisting of many short, narrow-band bursts in the

	metric range (300 - 50 MHz).; "Type II" 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).
Solar Flare	An explosive event in the Sun's atmosphere which produces electromagnetic radiation across the electromagnetic spectrum at multiple wavelengths from long-wave radio to the shortest wavelength gamma rays.
Solar Wind Extreme	Intervals of unusually large or small values of solar wind attributes such as flow speed and ion density.
Stream Interaction Region	The region (SIR) where two solar wind streams, typically having differing characteristics and solar sources, abut up against (and possibly partially interpenetrate) each other.
Substorm	A process by which plasma in the magnetotail becomes energized at a fast rate.

Processing Level List — Closed

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

Term	Definition
Calibrated	Data wherein sensor outputs have been convolved with instrument response function, often irreversibly, to yield 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.
Cross Spectrum	The Fourier transform of the cross correlation of two physical or empirical observations.
Deviation	The difference between an observed value and the expected value of a quantity.
Differential	A flux measurement within a given energy and solid-angle range.
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.
Direction Angle	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.
Field-Aligned	The component of a quantity which is oriented in the same direction of a field.
Fit	Values that make an model agree with the data.
Group	An assemblage of values that a certain relation or common characteristic.
Integral	The summation of values above a given threshold and over area or solid-angle range.
Line Of Sight	The line of sight is the line that connects the observer with the observed object. This expression is often used with measurements of Doppler velocity and magnetic field in magnetograms, where only the component of the vector field directed along the line of sight is measured.
Linear	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.
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.
Phase Angle	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. 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
Standard Deviation	The square root of the average of the squares of deviations about the mean of a set of data. Standard deviation is a statistical measure of spread or variability.
Stoke's Parameters	A set of four parameters (usually called I,Q, U and V) which describe the polarization state of an electromagnetic wave propagating through space.
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

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

Role List — Closed

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

Term	Definition
Archive Specialist	An individual who is an expert on a collection of resources and may also be knowledgeable of the phenomenon and related physics represented by the resources. This includes librarians, curators, archive scientists and other experts.
Co-Investigator	An individual who is a scientific peer and major participant in an investigation.
Contributor	An entity responsible for making contributions to the content of the resource.
Data Producer	An individual who generated the resource and is familiar with its provenance.
Deputy-PI	An individual who is an administrative or scientific leader for an investigation operating under the supervision of a Principal Investigator.
General Contact	An individual who can provide information on a range of subjects or who can direct you to a domain expert.
Metadata Contact	An individual who can affect a change in the metadata describing a resource.
Principal Investigator	An individual who is the administrative and scientific lead for an investigation.
Project Scientist	An individual who is an expert in the phenomenon and related physics explored by the project. A project scientist may also have a 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.
Team Leader	An individual who is the designated leader of an investigation.
Team Member	An individual who is a major participant in an investigation.
Technical Contact	An individual who can provide specific information with regard to the resource or supporting software

Scale Type List — Closed

Identifiers for scaling applied to a set of numbers.

Term	Definition
Linear Scale	Intervals which are equally spaced.
Log Scale	Intervals which are spaced proportionally to the logarithms of the values being represented.

Source Type 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.

Spectral Range List — Closed

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

Term	Definition
Ca-K	A spectrum with a wavelength of range centered near 393.5 nm. VSO nickname: Ca-K image with range of 391.9 nm to 395.2 nm.
Extreme Ultraviolet	A spectrum with a wavelength range of 10.0 nm to 125.0nm. VSO nickname: EUV image with a range of of 10.0 nm to 125.0 nm
Far Ultraviolet	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

Gamma Rays	Photons with a wavelength range: 0.00001 to 0.001 nm
H-alpha	A spectrum with a wavelength range centered at 656.3 nm. VSO nickname: H-alpha image with a spectrum range of of 655.8 nm to 656.8 nm.
Hard X-rays	Photons with a wavelength range: 0.001 to 0.1 nm and an energy range of 12 keV to 120 keV
He-10830	A spectrum with a wavelength range centered at 1082.9 nm. VSO nickname: He 10830 image with a range of 1082.5 nm to 1083.3 nm.
He-304	A spectrum centered around the resonance line of ionised helium at 304 Angstrom (30.4 nm).
Infrared	Photons with a wavelength range: 760 to 1.00x10^6 nm
K-7699	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.
LBH Band	Lyman-Birge-Hopfield band in the far ultraviolet range with wavelength range of 140nm to 170 nm.
Microwave	Photons with a wavelength range: 1.00x10^6 to 1.50x10^7 nm
Na-D	A spectrum with a wavelength range of centered at 589.3 nm. VSO nickname: Na-D image with a range of 588.8 nm to 589.8 nm.
Ni-6768	A spectrum with a wavelength range centered at 676.8 nm. VSO nickname: Ni-6768 dopplergram with a range of of 676.7 nm to 676.9 nm.
Optical	Photons with a wavelength range: 380 to 760 nm
Radio Frequency	Photons with a wavelength range: 100,000 to 1.00x10^11 nm
Soft X-Rays	X-Rays with an energy range of 0.12 keV to 12 keV.
Ultraviolet	Photons with a wavelength range: 10 to 400 nm.
White-Light	Photons with a wavelength in the visible range for humans.
X-Rays	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 2100 km above the photosphere, and characterized by temperatures from 4500 - 28000 K.
Corona	The outermost atmospheric region of the Sun or a star, characterized by ionization temperatures above 10^5 K. The solar corona starts at about 2100 km above the photosphere; there is no generally defined upper limit.
Interior	The region inside the body which is not visible from outside the body.
Photosphere	The atmospheric layer of the Sun or a star from which continuum radiation, especially optical, is emitted to

	space. For the Sun, the photosphere is about 500 km thick.
Transition Region	A very narrow (<100 km) layer between the chromosphere and the corona where the temperature rises abruptly from about 8000 to about 500,000 K.

Support Quantity List — Closed

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

Term	Definition
Instrument Mode	
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.

Wave Quantity List — Closed

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

Term	Definition
AC-Electric Field	Alternating electric field component of a wave.
AC-Magnetic Field	Alternating magnetic field component of a wave.
Absorption	Decrease of radiant energy (relative to the background continuum spectrum).
Doppler Frequency	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.
Energy Flux	The amount of energy passing through a unit area in a unit time.
Equivalent Width	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.
Line Depth	The measure of the amount of absorption below the continuum (depth) in a particular wavelength or frequency in an absorption spectrum.
Magnetic Field	A region of space near a magnetized body where magnetic forces can be detected (as measured by methods such as Zeeman splitting, etc.).
Mode Amplitude	In helioseismology the magnitude of oscillation of waves of a particular geometry.
Plasma Frequency	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.
Poynting Flux	Electromagnetic energy flux transported by a wave characterized as the rate of energy transport per unit area per steradian.
Propagation Time	Time difference between transmission and reception of a wave in an active wave experiment.
Stoke's Parameters	A set of four parameters (usually called I,Q, U and V) which describe the polarization state of an electromagnetic wave propagating through space.
Velocity	Rate of change of position. Also used for the average velocity of a collection of particles, also referred to as "bulk velocity".
Wavelength	The peak-to-peak distance over one wave period.

Wave Type List — Closed

Identifiers for the carrier or phenomenum 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	Periodic or quasi-periodic oscillations of fluid quantities.
MHD	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).
Plasma Waves	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
XR	0.001	0.1	0.025	0.25	0.02	2
SXR	0.1	10	0.25	10	2	10
EUV	10	121	10	90	10	150
V	200	760	90	400	90	400

10. Bibliography

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

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

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

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

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

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

11. Index

12. Change History

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

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

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

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

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

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

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

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

0.99.8

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

0.99.9

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

1.0.0

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

1.0.1

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

1.0.2

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

1.0.3

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

1.1.0	
2006-08-31	Removed "Orbital".
2006-08-31	Modified definition of "Near Earth".
2006-08-31	Changed "Instrument type" to allow multiple occurrences.
2006-08-31	Made data type of "Mixed" text.
2006-08-31	Added "Service" resource class.
2006-08-31	Updated description of "Resource ID".
2006-08-31	Added MAT_4, MAT_6, MAT_7 and VOTable as a Format.
2006-08-31	Added J2000 as a coordinate system.
2006-08-31	Added Base64 as an Encoding.
2006-08-31	Added Parent ID, Energy Range, Frequency Range, Azimuthal Angle Range, Polar Angle Range, Atomic Number Range, Integral, Differential, Low and High.
2006-08-31	Remove Coordinate System from Particle Physical Parameter.
2006-08-31	Updated Pressure definition.
2006-08-31	Add ObservatoryID under Instrument.
2006-08-31	Remove Observatory ID from Numerical Data and Display Data.
2006-08-31	Changed definition of Investigation Name.
2006-08-31	Remove Access Right from Display Data.
2006-08-31	Change Repository Name to Repository ID under Access Information.
2006-08-31	Added Granule.
2006-08-31	Added Parameter Key under Physical Parameter.
2006-08-31	Add Release Date to Resource Header, Person, and Granule.
2006-08-31	Changed "alias" to "alternate name".
2006-08-31	Removed "Instrument Name" and "Observatory Name".
2006-08-31	Added ChargeState to Particle Quantity.
2006-08-31	Add Field Component container.
2006-08-31	Add Statistics to Phenomenon Type.
2006-08-31	Released.

1.1.1	
	Changed InstrumentID and Bin to multiple occurrence. Removed enumeration of Component. Modified definition of Units. Changed AccessURL to type container.

1.2.0	
2007-05-22	Added Aurora and Substorm under Phenomenon Type.
2007-05-22	Added Checksum, Hash Value, Hash Function, MD5 and SHA1, SHA256.
2007-05-22	Added Note as a term and added Note under Timespan.
2007-05-22	Added all planets, Comet and Asteroid as regions.
2007-05-22	Added Data Extent, Bytes and Per to describe the size of a resource.
2007-05-22	Added Data Extent to Access URL and Granule.
2007-05-22	Added the ValidMin, ValidMax and FillValue to Physical Parameter.
2007-05-22	Added Uncertainty and Standard Deviation to qualifiers.
2007-05-22	Added Expiration Date to Resource Header and Granule.
2007-05-22	Added Longitude and Latitude to Orientation.
2007-05-22	Updated Phi and Theta definitions.
2007-05-22	Added Ephemeris as an Instrument Type.
2007-05-22	Added Sequence as a element type and changes Size to a Sequence.
2007-05-22	Defined PriorID and added PriorID to ResourceHeader and Granule.
2007-05-22	Changed InstrumentID in DisplayData and

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

1.2.1

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

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

1.2.2

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

1.3.0

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

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

1.3.1

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

1.3.2

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

1.3.3

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

1.3.4

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

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

1.3.5

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

1.3.6

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

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

2.0.0

2009-04-15	Released.

2.0.1

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

2.0.2

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

2.0.3

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

2.1.0

2010-03-19	Released.

2.2.0

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

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

2.2.1

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

2.2.2

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

2.2.3

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

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

2.2.4

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

2.2.5

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

2.2.6

2015-09-09	Released.

2.2.7

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

2.2.8

2016-07-21	Released.

2.2.9

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

2.2.10

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