SPASE Base Model
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1. Executive Summary

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

The Data Model provides enough detail to allow a scientist to understand the content of Data Products (e.g., a set of files for 3 second resolution Geotail magnetic field data for 1992 to 2005), together with essential retrieval and contact information. It also allows for the incremental annotation of resources with expert assessments and the free association of resources to create bundles or networks of resources. Resource descriptions can be stored with the data or at remote locations. Sites can harvest the resource descriptions to enable services like a search engine or portal (Virtual Observatory). A typical use would be to have a collection of descriptions stored in one or more related internet-based registries of products; that can be queried with specifically designed search engines and ultimately link users to the data they need. The Data Model also provides constructs for describing components of such a data delivery system. This includes repositories, registries and services.

The SPASE group website is located at https://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 https://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 fully describe a Numerical Data resource requires other types of Resources, namely Observatory, Instrument, Person, and Repository, whose names are self-explanatory, and each of which has its own set of attributes. Often, numerical data are presented in prepared images (gif or jpeg), and such presentations are referred to as Display Data resources. The other data related resource types are Catalog which are lists of events; Annotation which enable expert comments on data products; and Granule which describe individual files within another resource (i.e., Numerical Data, Display Data or Catalog). Other types of resources include Document which can contain narratives or supporting information; Service that provide software to use data resources; Repository for storage locations; and Registry for metadata collections. Resource descriptions and the links in them are intended to make the Resource useful to scientific users.

2.1. History of Development

The data model presented here has grown from the efforts begun in 2002 that became formalized in regular teleconferences of a group of interested data providers, including scientific and technical representatives of some of the largest data holdings in the US, Europe, and Japan. As the effort to provide seamless access to distributed data proceeded, it became clear that the data model efforts were central. The SPASE Data Model was developed with an iterative process where additions were made when unaddressed needs were discovered. The original impetus occurred at an ISTP meeting in 1998 where a resolution was passed calling to make data more accessible. Interoperability test beds were constructed in 2001 and in 2002 a grassroots effort was undertaken to define the needs of community. In March of 2003 a meeting of many of the people in the Contributors list at the beginning of this document was convened to begin the data model construction in earnest. The initial effort involved collecting terms from CDPP, SWRI, NSSDC, ISTP, and other sets to form a starting point. Two years of teleconferences, e-mailed revisions, and occasional face-to-face efforts, along with the application of the terms to specific cases, led to the release of version 1.0 of the data model in November 2005. Following the release of version 1.0 many existing data products were described and 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 https://hpde.gsfc.nasa.gov gives a guide to many currently active projects and a great deal of background information. Of particular interest there is the document entitled, "A Framework for Space and Solar Physics Virtual Observatories."

Figure 1 illustrates a conceptual architecture in a distributed environment. In this environment multiple communities have resources to share. The storage location of a resource is called a repository. Some of these repositories (boxes) have local SPASE descriptions which are available through a local registry service (balls). The contents of other repositories are described at external, possibly independent, locations which make the descriptions available through remote registries. Gateways (rings) can harvest and aggregate the resources from multiple registries or perform federated searches which provide a single access point to multiple registries. Applications access the registries to discover resources, determine their location and retrieve them from the repositories.
Figure 1: A possible data environment architecture. Information and data flows from Repositories to Applications through Access Points and Gateways. In this model, any Access Point or Gateway may be considered an instance of a Virtual Observatory. The portions of the system using SPASE-Data-Model-based messages are indicated with the $\mathcal{S}$.
3. SPASE Data Model

3.1. Resource Types

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

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

3.1.1. Data Resources

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

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

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, and
- Person

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
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.

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. 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.

#### 3.4.1 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.

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
   1. Must be preceded by a blank line.
   2. 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)
   3. End with a blank line.
3. Tables
   1. Begin and end with a line that starts with "+---".
   2. The first "row" of a table is the field headings.
   3. Fields in a table are separated with a vertical bar ("|").
   4. Visual row separators are lines which begin with "|--".

3.5. 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.
4. Guidelines for Metadata Descriptions

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

To determine what level of detail is needed, we recommend considering not only what the user needs to find the correct data, but also what is necessary to know if the data will be useful for the requestor’s purpose. The user might get this information by contacting you, but if the data were moved somewhere else and only the data description were available to determine the utility of the data, consider if the user would have sufficient information to know if this is the right data set and what problems might be associated with the use of these data. Also consider if additional documentation is necessary and if so create an Document resource and associate it with the data resource. An "Information URL" may also be used to provide links to more detailed information.

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

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

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<Spase>
  <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
<?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>
    </ResourceHeader>
    <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>
      <PersonID>spase://SMWG/Person/James.M.Weygand</PersonID>
    </Contact>
  </NumericalData>
</Spase>
```
<ResourceHeader/>

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

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

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

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

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

<Parameter>
  <Name>MAGNETIC_FIELD_VECTOR</Name>
  <Units>nT</Units>
  <CoordinateSystem>
    <CoordinateRepresentation>Cartesian</CoordinateRepresentation>
    <CoordinateSystemName>GSE</CoordinateSystemName>
  </CoordinateSystem>
  <Description>
    Magnetic field vector in GSE Coordinates (Bx, By, Bz).
  </Description>
  <Field>
    <Qualifier>Vector</Qualifier>
    <FieldQuantity>Magnetic</FieldQuantity>
  </Field>
</Parameter>

<Parameter>
  <Name>SPACECRAFT_POSITION_VECTOR</Name>
  <CoordinateSystem>
    <CoordinateRepresentation>Cartesian</CoordinateRepresentation>
    <CoordinateSystemName>GSE</CoordinateSystemName>
  </CoordinateSystem>
  <Description>
  </Description>
  <Field>
    <Qualifier>Vector</Qualifier>
  </Field>
</Parameter>
ACE spacecraft location in GSE coordinates (X,Y,Z).
6. 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. If "Container" is specified the element must have sub-elements specified.

**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 the "Text Mark-up" section in specification document for complete details.

URL
Universal Resource Locator

ID
SPASE Identifier
7. Enumerations

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

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

Allowed Values:
- Open
- PartiallyRestricted
- Restricted

AdiabaticInvariant
Identifiers for properties of a physical system related to periodic phenomena that remains constant under slowly varying conditions.

Allowed Values:
- MagneticMoment
- BounceMotion
- DriftMotion

AnnotationType
Identifiers for an classification of an annotation.

Allowed Values:
- Anomaly
- Event
- Feature

ApplicationInterface
Identifiers for the type of interface for the application.

Allowed Values:
- CLI
- GUI
- API

AssociationType
Identifiers for resource associations.

Allowed Values:
- ChildEventOf
- DerivedFrom
- ObservedBy
- Other
- PartOf
- RevisionOf

Availability
Identifiers for indicating the method or service which may be used to access the resource.
Allowed Values:
- Offline
- Online

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

Allowed Values:
- Automatic
- Inferred
- Inspection

**Component**
Identifiers for the axis of coordinate systems.

Allowed Values:
- I
- J
- K

**ConfidenceRating**
Identifiers for the classification of the certainty of an assertion.

Allowed Values:
- Probable
- Strong
- Unlikely
- Weak

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

Allowed Values:
- Cartesian
- Cylindrical
- Spherical

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

Allowed Values:
- Carrington
- CGM
- CSO
- DM
- ECD
- ECEF
- ENP
- GEI
- GEO
- GPHIO
- GSE
- GSEQ
- GSM
- HAE
DirectionAngle
   Identifiers for the angle between a vector and a base axis.
   Allowed Values:
      AzimuthAngle
      ElevationAngle
      PolarAngle

DirectionCosine
   Identifiers for the cosine of the angle between two vectors in a three dimensional Euclidean space.
   Allowed Values:
      I
      J
      K

DisplayType
   Identifiers for types or classes of rendered data.
Allowed Values:
- Image
- Plasmagram
- Spectrogram
- StackPlot
- TimeSeries
- WaveForm

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

Allowed Values:
- Convention
- Other
- Policy
- Poster
- Presentation
- Report
- Specification
- TechnicalNote
- WhitePaper

**Earth**
Identifiers for the regions surrounding the Earth.

Allowed Values:
- Magnetosheath
- Magnetosphere
- Moon
- NearSurface
- Surface

**Encoding**
Identifiers for unambiguous rules that establishes the representation of information within a file.

Allowed Values:
- ASCII
- Base64
- BZIP2
- GZIP
- None
- S3_BUCKET
- TAR
- Unicode
- ZIP

**FieldQuantity**
Identifiers for the physical attribute of the field.

Allowed Values:
- Current
- Electric
- Electromagnetic
- Gyrofrequency
Format

Identifiers for data organized according to preset specifications.

Allowed Values:

- AVI
- Binary
- CDF
- CEF
- CEF1
- CEF2
- CSV
- Excel
- FITS
- GIF
- Hardcopy
- HDF
- HDF4
- HDF5
- HTML
- IDFS
- IDL
- JPEG
- JSON
- MATLAB_4
- MATLAB_6
- MATLAB_7
- MPEG
- NCAR
- NetCDF
- PDF
- PDS4
- PDS3
- PNG
- Postscript
- QuickTime
- RINEX2
- RINEX3
- Text
- TFCat
- TIFF
- UDF
- VOTable
- XML

Hardcopy

Identifiers for permanent reproductions, or copy in the form of a physical object, of any media suitable for direct use by a person.
Allowed Values:
- Film
- Microfiche
- Microfilm
- Photograph
- PhotographicPlate
- Print

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

Allowed Values:
- MD5
- SHA1
- SHA256

Heliosphere
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.

Allowed Values:
- Heliosheath
- Inner
- NearEarth
- Outer
- Remote1AU

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

Allowed Values:
- Antenna
- Channeltron
- Coronograph
- DoubleSphere
- DustDetector
- ElectronDriftInstrument
- ElectrostaticAnalyser
- EnergeticParticleInstrument
- Experiment
- FaradayCup
- FluxFeedback
- FourierTransformSpectrograph
- GeigerMuellerTube
- Imager
- ImagingSpectrometer
- Interferometer
- IonChamber
- IonDrift
- IonGauge
- LangmuirProbe
LongWire
Magnetograph
Magnetometer
MassSpectrometer
MicrochannelPlate
MultispectralImager
NeutralAtomImager
NeutralParticleDetector
ParticleCorrelator
ParticleDetector
Photometer
PhotomultiplierTube
Photopolarimeter
Platform
ProportionalCounter
QuadrisphericalAnalyser
Radar
Radiometer
ResonanceSounder
RetardingPotentialAnalyser
Riometer
ScintillationDetector
SearchCoil
SolidStateDetector
Sounder
SpacecraftPotentialControl
SpectralPowerReceiver
Spectrometer
TimeOfFlight
Unspecified
WaveformReceiver

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

Allowed Values:
Area
Bandwidth
SolidAngle

Ionosphere
Identifiers for ionospheric regions.

Allowed Values:
DRegion
ERegion
FRegion
Topside

Jupiter
Identifiers for the regions surrounding the planet Jupiter.

Allowed Values:
Callisto
Europa
Ganymede
Io
Magnetosphere

Magnetosphere
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.

Allowed Values:
- Magnetotail
- Main
- Plasmasphere
- Polar
- RadiationBelt
- RingCurrent

Mars
Identifiers for the regions surrounding the planet Mars.

Allowed Values:
- Deimos
- Magnetosphere
- Phobos

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

Allowed Values:
- ActivityIndex
- Dopplergram
- Dust
- ElectricField
- EnergeticParticles
- Ephemeris
- ImageIntensity
- InstrumentStatus
- IonComposition
- Irradiance
- MagneticField
- Magnetogram
- NeutralAtomImages
- NeutralGas
- Profile
- Radiance
- Spectrum
- SPICE
- ThermalPlasma
- Waves

Mercury
Identifiers for the regions surrounding the planet Mercury.

Allowed Values:
Magnetosphere

MixedQuantity
Identifiers for the combined attributes of a mixed parameter quantity.

Allowed Values:
- AkasofuEpsilon
- AlfvenMachNumber
- AlfvenVelocity
- FrequencyToGyrofrequencyRatio
- IMFClockAngle
- MagnetosonicMachNumber
- Other
- PlasmaBeta
- SolarUVFlux
- TotalPressure
- VCrossB

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

Allowed Values:
- Atmosphere
- AuroralRegion
- EquatorialRegion
- Ionosphere
- Mesosphere
- MidLatitudeRegion
- Plasmasphere
- PolarCap
- SouthAtlanticAnomalyRegion
- Stratosphere
- SubAuroralRegion
- Thermosphere
- Troposphere

Neptune
Identifiers for the regions surrounding the planet Neptune.

Allowed Values:
- Magnetosphere
- Proteus
- Triton

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

Allowed Values:
- AdiabaticInvariant
- ArrivalDirection
- AtomicNumberDetected
- AverageChargeState
- ChargeFlux
- ChargeState
- CountRate
Counts
DynamicPressure
Energy
Entropy
EnergyDensity
EnergyFlux
EnergyPerCharge
FlowSpeed
FlowVelocity
Fluence
GeometricFactor
Gyrofrequency
HeatFlux
LShell
Mass
MassDensity
MassNumber
MassPerCharge
NumberDensity
NumberFlux
ParticleRadius
ParticleRigidity
PhaseSpaceDensity
PlasmaFrequency
Pressure
SonicMachNumber
SoundSpeed
Temperature
ThermalSpeed
Velocity

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

Allowed Values:
- Aerosol
- AlphaParticle
- Atom
- Dust
- Electron
- Ion
- Molecule
- Neutron
- Proton
- Positron

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

Allowed Values:
- ActiveRegion
Aurora
BowShockCrossing
CoronalHole
CoronalMassEjection
EITWave
EnergeticSolarParticleEvent
ForbushDecrease
GeomagneticStorm
InterplanetaryShock
MagneticCloud
MagnetopauseCrossing
RadioBurst
SectorBoundaryCrossing
SolarFlare
SolarWindExtreme
StreamInteractionRegion
Substorm

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

Allowed Values:
Calibrated
Raw
Uncalibrated
ValueAdded

Projection
Identifiers to projections into a coordinate system.

Allowed Values:
IJ
IK
JK

Uranus
Identifiers for the regions surrounding the planet Uranus.

Allowed Values:
Ariel
Magnetosphere
Miranda
Oberon
Puck
Titania
Umbriel

Venus
Identifiers for the regions surrounding the planet Venus.

Allowed Values:
Magnetosphere

Qualifier
Identifiers for terms which refine the type or attribute of a quantity.
Allowed Values:

Anisotropy
Array
AutoSpectrum
Average
Characteristic
Circular
Coherence
Column
Component
Confidence
Core
CrossSpectrum
Deviation
Differential
Direction
Directional
DirectionAngle
DirectionCosine
EncodedParameter
FieldAligned
Fit
Group
Halo
ImaginaryPart
Integral
Linear
LineOfSight
Magnitude
Maximum
Median
Minimum
Moment
Parallel
Peak
Perpendicular
Perturbation
Phase
PhaseAngle
PowerSpectralDensity
Projection
Pseudo
Ratio
RealPart
Scalar
Spectral
StandardDeviation
StokesParameters
Strahl
Superhalo
Symmetric
Region
Identifiers for areas of the physical world which may be occupied or observed.

Allowed Values:
- Asteroid
- Comet
- Earth
- Heliosphere
- Interstellar
- Jupiter
- Mars
- Mercury
- Neptune
- Pluto
- Saturn
- Sun
- Uranus
- Venus

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

Allowed Values:
- ColorBar
- Horizontal
- Vertical

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

Allowed Values:
- Author
- ArchiveSpecialist
- CoInvestigator
- CoPI
- Contributor
- DataProducer
- DeputyPI
- Developer
- FormerPI
- GeneralContact
- HostContact
- InstrumentLead
- InstrumentScientist
- MetadataContact
- MissionManager
- MissionPrincipalInvestigator
Saturn
Identifiers for the regions surrounding the planet Saturn.

Allowed Values:
- Dione
- Enceladus
- Iapetus
- Magnetosphere
- Mimas
- Rhea
- Tethys
- Titan

ScaleType
Identifiers for scaling applied to a set of numbers.

Allowed Values:
- LinearScale
- LogScale

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

Allowed Values:
- Ancillary
- Browse
- Data
- Layout
- Thumbnail

SpectralRange
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.

Allowed Values:
- CaK
- ExtremeUltraviolet
- FarUltraviolet
- GammaRays
Halpha
HardXrays
He10830
He304
Infrared
K7699
LBHBand
Microwave
NaD
Ni6768
Optical
RadioFrequency
SoftXrays
Ultraviolet
WhiteLight
XRays

Style
Identifiers for the manner in which a response from a URL is presented.

Allowed Values:
EPNTAP
File
Git
HAPI
Listing
Search
TAP
Template
Overview
WebService

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

Allowed Values:
Chromosphere
Corona
Interior
Photosphere
TransitionRegion

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

Allowed Values:
DataQuality
Housekeeping
InstrumentMode
Orientation
Other
Positional
Remark
RotationMatrix
SpinPeriod
SpinPhase
SpinRate
Telemetry
Temporal
Velocity
WebResource
WebService

Text
Identifiers for the encoding of sequences of characters.

Allowed Values:
ASCII
Unicode

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

Allowed Values:
Absorption
ACElectricField
ACMagneticField
Albedo
DopplerFrequency
Emissivity
EnergyFlux
EquivalentWidth
Frequency
Gyrofrequency
Intensity
LineDepth
LowerHybridFrequency
MagneticField
ModeAmplitude
PlasmaFrequency
Polarization
PoyntingFlux
PropagationTime
StokesParameters
UpperHybridFrequency
Velocity
VolumeEmissionRate
Wavelength

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

Allowed Values:
Electromagnetic
Electrostatic
Hydrodynamic
MHD
Photon
PlasmaWaves

Waves
Identifiers for experimental and natural wave phenomena.

Allowed Values:
   Active
   Passive
8. Data Model Tree

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** (+)
    + **ResourceId** (1)
    + **ResourceHeader** (1)
      + **ResourceName** (1)
      + **AlternateName** (*)
      + **DOI** (0)
      + **ReleaseDate** (1)
      + **RevisionHistory** (0)
        + **RevisionEvent** (+)
          + **ReleaseDate** (1)
          + **Note** (1)
      + **ExpirationDate** (0)
    + **Description** (1)
    + **Acknowledgement** (0)
    + **PublicationInfo** (0)
      + **Authors** (1)
      + **PublicationDate** (1)
      + **PublishedBy** (1)
    + **Funding** (*)
      + **Agency** (1)
      + **Project** (1)
      + **AwardNumber** (0)
    + **Contact** (+)
      + **PersonID** (1)
      + **Role** (+)
      + **StartDate** (0)
      + **StopDate** (0)
      + **Note** (0)
    + **InformationURL** (*)
      + **Name** (0)
      + **URL** (1)
      + **Description** (0)
      + **Language** (0)
    + **Association** (*)
      + **AssociationID** (1)
      + **AssociationType** (1)
      + **Note** (0)
    + **PriorID** (*)
      + **AccessInformation** (+)
        + **RepositoryID** (1)
+ Availability (0)
+ AccessRights (0)
+ AccessURL (+)
  + Name (0)
  + URL (1)
  + Style (0)
  + ProductKey (*)
  + Description (0)
  + Language (0)
+ Format (+)
+ Encoding (0)
+ DataExtent (0)
  + Quantity (1)
  + Units (0)
  + Per (0)
+ Acknowledgement (0)
+ ProviderName (0)
+ ProviderResourceName (0)
+ ProviderVersion (0)
+ InstrumentID (*)
+ PhenomenonType (+)
+ TimeSpan (0)
  + startDate (1)
  + StopDate (1)
  + RelativeStopDate (1)
  + Note (*)
+ Caveats (0)
+ Keyword (*)
+ InputResourceId (*)
+ Parameter (*)
  + Name (1)
  + Set (*)
  + ParameterKey (0)
  + Description (0)
  + UCD (0)
  + Caveats (0)
  + Cadence (0)
  + CadenceMin (0)
  + CadenceMax (0)
  + Units (0)
  + UnitsConversion (0)
+ CoordinateSystem (0)
  + CoordinateRepresentation (1)
  + CoordinateSystemName (1)
+ RenderingHints (*)
  + DisplayType (0)
  + AxisLabel (0)
  + RenderingAxis (0)
  + Index (0)
  + ValueFormat (0)
  + ScaleMin (0)
+ ScaleMax (0)
+ ScaleType (0)
+ Structure (0)
+ Size (1)
+ Description (0)
+ Element (*)
  + Name (1)
  + Qualifier (*)
  + Index (1)
  + ParameterKey (0)
  + Units (0)
  + UnitsConversion (0)
  + ValidMin (0)
  + ValidMax (0)
  + FillValue (0)
+ RenderingHints (0)
  + DisplayType (0)
  + AxisLabel (0)
  + RenderingAxis (0)
  + Index (0)
  + ValueFormat (0)
  + ScaleMin (0)
  + ScaleMax (0)
  + ScaleType (0)
+ ValidMin (0)
+ ValidMax (0)
+ FillValue (0)
+ Field (1)
  + Qualifier (*)
  + FieldQuantity (1)
  + FrequencyRange (0)
    + SpectralRange (0)
    + Low (1)
    + High (1)
    + Units (1)
    + Bin (*)
      + BandName (0)
      + Low (1)
      + High (1)
+ Particle (1)
  + ParticleType (*)
  + Qualifier (*)
  + ParticleQuantity (1)
  + AtomicNumber (*)
+ EnergyRange (0)
  + Low (1)
  + High (1)
  + Units (1)
  + Bin (*)
    + BandName (0)
    + Low (1)
+ FrequencyRange (0)
  + SpectralRange (0)
  + Low (1)
  + High (1)
  + Units (1)
  + Bin (*)
    + BandName (0)
    + Low (1)
    + High (1)

+ Particle (1)
  + ParticleType (*)
  + Qualifier (*)
  + ParticleQuantity (1)
  + AtomicNumber (*)
  + EnergyRange (0)
    + Low (1)
    + High (1)
    + Units (1)
    + Bin (*)
      + BandName (0)
      + Low (1)
      + High (1)
  + AzimuthalAngleRange (0)
    + Low (1)
    + High (1)
    + Units (1)
    + Bin (*)
      + BandName (0)
      + Low (1)
      + High (1)
  + PolarAngleRange (0)
    + Low (1)
    + High (1)
    + Units (1)
    + Bin (*)
      + BandName (0)
      + Low (1)
      + High (1)
  + MassRange (0)
    + Low (1)
    + High (1)
    + Units (1)
    + Bin (*)
      + BandName (0)
      + Low (1)
      + High (1)
  + PitchAngleRange (0)
    + Low (1)
    + High (1)
    + Units (1)
    + Bin (*)
9. Dictionary

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:

Absorption  Item
Decrease of radiant energy (relative to the background continuum spectrum).
Since: 1.3.5

AccessInformation  Container
Attributes of the resource which pertain to how to accessing the resource, availability and storage format.
Since: 1.0.0

Sub-elements
RepositoryID
Availability
AccessRights
AccessURL
Format
Encoding
DataExtent
Acknowledgement

Used by: Catalog
DisplayData
Document
NumericalData

AccessRights  Enumeration
Permissions granted or denied by the host of a product to allow other users to access and use the resource.
Since: 1.0.0
Allowed Values: Open, PartiallyRestricted, Restricted

Used by: AccessInformation, Installer

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

Since: 1.0.0

Sub-elements: Name, URL, Style, ProductKey, Description, Language

Used by: AccessInformation, Registry, Repository, Service

ACElectricField
Alternating electric field component of a wave.

Since: 1.3.5

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

Since: 1.0.0

Used by: AccessInformation, Installer, ResourceHeader

ACMagneticField
Alternating magnetic field component of a wave.

Since: 1.3.5

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.

Since: 1.3.0

ActiveRegion
A localized, transient volume of the solar atmosphere in which PLAGEs, SUNSPOTS, FACULAE, FLAREs, etc. may be observed.
ActivityIndex
An indication, derived from one or more measurements, of the level of activity of an object or region, such as sunspot number, F10.7 flux, Dst, or the Polar Cap Indices.

Since: 1.0.0

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

Since: 1.0.0
Used by: Person

AdiabaticInvariant
A property of a physical system usually related to periodic phenomena that remains constant under slowly varying conditions.

Since: 2.3.1
Allowed Values
- MagneticMoment
- BounceMotion
- DriftMotion

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

Since: 1.0.0

Agency
The name of an organization that provides a service or funding for specific projects.

Since: 2.3.0
Used by: Funding

AkasofuEpsilon
A measure of the magnetopause energy flux and an indicator of the solar wind power available for subsequent magnetospheric energization. Defined as: \( V^2 B^2 l^2 \sin(\theta/2)^4 \) where \( B \) is the IMF, \( l \) is an empirical scaling parameter equal to 7 RE, and \( \theta = \tan(BY/BZ)^{-1} \) the IMF clock angle.

Since: 1.3.5

Albedo
The ratio of reflected radiation from the surface to incident radiation upon it.

Since: 2.2.2

AlfvenMachNumber
The ratio of the bulk flow speed to the Alfven speed.
Alfvén Velocity
Phase velocity of the Alfvén 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 (μ). Since: 1.3.5

Alpha Particle
A positively charged nuclear particle that consists of two protons and two neutrons. Since: 1.0.0

Alternate Name
An alternative or shortened name used to refer to a resource. This includes acronyms, expanded names or a synonym for a resource. Since: 1.1.0

Ancillary
A complementary item which can be subordinate, subsidiary, auxiliary, supplementary to the primary item. Since: 1.3.1

Anisotropy
Direction-dependent property. Since: 1.2.1

Annotation
Information which is explanatory or descriptive which is associated with another resource. Since: 1.3.4
Sub-elements:
- Resource ID
- Resource Header
- Image URL
- Annotation Type
- Phenomenon Type
- Classification Method
- Confidence Rating
- Time Span
- Observation Extent
- Extension

Used by: Space

Annotation Type
A classification for an annotation.
Since: 1.3.4

**Anomaly**

An interval where measurements or observations may be adversely affected.

Since: 1.3.4

**Antenna**

A sensor used to measure electric potential.

Since: 1.0.0

**API**

An application programming interface (API) is a form of interface that allows applications to access the features or data of an operating system, application, or other service. An API may have a required protocol or set of principles. Some examples of protocols are SOAP, XML-RPC and JSON-RPC. An example of an API with a set of principles is REST.

Since: 2.4.0

**ApplicationInterface**

The type of interface for the application.

Since: 2.4.0

Allowed Values
- **CLI**
- **GUI**
- **API**

Used by: **Software**

**ArchiveSpecialist**

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

Since: 1.2.1

**Area**

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

Since: 1.3.6

**Ariel**

The fourth-largest moon of Uranus.

Since: 2.2.5
<table>
<thead>
<tr>
<th><strong>Array</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A sequence of values corresponding to the elements in a rectilinear, n-dimension matrix. Each value can be referenced by a unique index.</td>
<td>Since: 1.2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ArrivalDirection</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Since: 2.0.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ASCII</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A sequence of characters that adheres to American Standard Code for Information Interchange (ASCII) which is an 7-bit character-coding scheme.</td>
<td>Since: 1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Association</strong></th>
<th>Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributes of a relationship a resource has with another resource.</td>
<td>Since: 1.3.3</td>
</tr>
</tbody>
</table>

  **Sub-elements**

<table>
<thead>
<tr>
<th><strong>AssociationID</strong></th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>The resource identifier for a resource with which this resource is closely associated.</td>
<td>Since: 1.1.0</td>
</tr>
<tr>
<td>Used by: ResourceHeader</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>AssociationType</strong></th>
<th>Enumeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>A characterization of the role or purpose of an associated resource.</td>
<td>Since: 1.3.3</td>
</tr>
</tbody>
</table>

  **Allowed Values**

  | **ChildEventOf** |
  | **DerivedFrom** |
  | **ObservedBy** |
  | **Other** |
  | **PartOf** |
  | **RevisionOf** |

  Used by: Association |

<table>
<thead>
<tr>
<th><strong>Asteroid</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A small extraterrestrial body consisting mostly of rock and metal that is in orbit around the sun.</td>
<td>Since: 1.2.0</td>
</tr>
<tr>
<td>Item</td>
<td>Definition</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Atmosphere</strong></td>
<td>The neutral gases surrounding a body that extends from the surface and is bound to the body by virtue of the gravitational attraction. Since:1.1.0</td>
</tr>
<tr>
<td><strong>Atom</strong></td>
<td>Matter consisting of a nucleus surrounded by electrons which has no net charge. Since:1.3.6</td>
</tr>
<tr>
<td><strong>AtomicNumber</strong></td>
<td>The number of protons in the nucleus of an atom. Since:1.1.0 Used by: <strong>Particle</strong></td>
</tr>
<tr>
<td><strong>AtomicNumberDetected</strong></td>
<td>The number of protons in the nucleus of an atom as determined by a detector. Since:1.1.0</td>
</tr>
<tr>
<td><strong>Author</strong></td>
<td>The composer of a literary work. This can include presentations, articles, books, white papers or any similar published work. Since:1.1.0</td>
</tr>
<tr>
<td><strong>Aurora</strong></td>
<td>An atmospheric phenomenon consisting of bands of light caused by charged solar particles following the earth's magnetic lines of force. Since:1.2.0</td>
</tr>
<tr>
<td><strong>AuroralRegion</strong></td>
<td>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. Since:1.1.0</td>
</tr>
<tr>
<td><strong>Authors</strong></td>
<td>A list of individuals or organizations who prepared the work (document, data, images or other types of resources). Separate multiple names with a semicolon. When an author is a person use &quot;last,first[,middle]&quot; format. Including a middle name is optional. Since:2.3.0 Used by: <strong>PublicationInfo</strong></td>
</tr>
<tr>
<td><strong>Automatic</strong></td>
<td>Determined by the analysis or assessment performed by a program or server.</td>
</tr>
</tbody>
</table>
### AutoSpectrum

The Fourier transform of the auto correlation function for physical or empirical observations, which describes the general dependence of the time series data values at one instant on the time series data values at another instant.

Since: 2.3.2

<table>
<thead>
<tr>
<th><strong>Available</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AutoSpectrum</strong></td>
<td>Item</td>
</tr>
<tr>
<td>The Fourier transform of the auto correlation function for physical or empirical observations, which describes the general dependence of the time series data values at one instant on the time series data values at another instant.</td>
<td></td>
</tr>
<tr>
<td>Since: 2.3.2</td>
<td></td>
</tr>
</tbody>
</table>

### Availability

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

Since: 1.0.0

<table>
<thead>
<tr>
<th><strong>Allowed Values</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Offline</strong></td>
<td>Enumeration</td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td></td>
</tr>
</tbody>
</table>

Used by: **AccessInformation**, **Installer**

### Average

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

Since: 1.0.0

<table>
<thead>
<tr>
<th><strong>Average</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The statistical mean; the sum of a set of values divided by the number of values in the set.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

### AverageChargeState

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

Since: 1.0.0

<table>
<thead>
<tr>
<th><strong>AverageChargeState</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A measure of the composite deficit (positive) or excess (negative) of electrons with respect to protons.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

### AVI

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

Since: 1.0.0

<table>
<thead>
<tr>
<th><strong>AVI</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio Video Interleave (AVI) a digital format for movies that conforms to the Microsoft Windows Resource Interchange File Format (RIFF).</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

### AwardNumber

The identifying information assigned to the financial support (funding) of a project.

Since: 2.3.0

<table>
<thead>
<tr>
<th><strong>AwardNumber</strong></th>
<th><strong>Text</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The identifying information assigned to the financial support (funding) of a project.</td>
<td></td>
</tr>
<tr>
<td>Since: 2.3.0</td>
<td></td>
</tr>
</tbody>
</table>

Used by: **Funding**

### AxisLabel

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.

Since: 1.3.1

<table>
<thead>
<tr>
<th><strong>AxisLabel</strong></th>
<th><strong>Text</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.3.1</td>
<td></td>
</tr>
</tbody>
</table>

Used by: **RenderingHints**

### AzimuthalAngleRange

The range of possible azimuthal angles for a group of energy observations. Default units are
The angle between the projection into the i-j plane of a position or measured vector and the i-axis of the coordinate system. Mathematically defined as \( \arctan(j/i) \). This term could be also applied to angles measured in different planes, for example the IMF clock angle defined as \( \arctan(|By|/Bz) \).

Since: 1.3.4

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

Since: 1.3.0

Integration over the width a frequency band.

Since: 1.3.6

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.

Since: 1.1.0

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

Since: 1.1.0

<table>
<thead>
<tr>
<th>WavelengthRange</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Binary</strong></td>
</tr>
<tr>
<td>A direct representation of the bits which may be stored in memory on a computer.</td>
</tr>
<tr>
<td>Since: 1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BounceMotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>The second adiabatic invariant is associated with periodic bounce motion of charged particles trapped between two magnetic mirrors on a magnetic field line. The second invariant, termed J, is defined by using the integral ( J = m \int v</td>
</tr>
<tr>
<td>Since: 2.3.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BowShockCrossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>A crossing of the boundary between the undisturbed (except for foreshock effects) solar wind and the shocked, decelerated solar wind of the magnetosheath.</td>
</tr>
<tr>
<td>Since: 1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Browse</th>
</tr>
</thead>
<tbody>
<tr>
<td>A representation of an image which is suitable to reveal most or all of the details of the image.</td>
</tr>
<tr>
<td>Since: 1.3.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BZIP2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since: 1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cadence</th>
</tr>
</thead>
<tbody>
<tr>
<td>The nominal or most common time interval between the start of successive measurements.</td>
</tr>
<tr>
<td>Since: 1.0.0</td>
</tr>
<tr>
<td>Used by: Parameter</td>
</tr>
<tr>
<td>TemporalDescription</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CadenceMax</th>
</tr>
</thead>
<tbody>
<tr>
<td>The largest time interval between the start of successive measurements.</td>
</tr>
<tr>
<td>Since: 2.2.9</td>
</tr>
<tr>
<td>Used by: Parameter</td>
</tr>
<tr>
<td>TemporalDescription</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CadenceMin</th>
</tr>
</thead>
<tbody>
<tr>
<td>The smallest time interval between the start of successive measurements.</td>
</tr>
</tbody>
</table>
Since:2.2.9
Used by: Parameter

TemporalDescription

CaK

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

Since:1.2.1

Calibrated

Data wherein sensor outputs have been convolved with instrument response function, often irreversibly, to yield data in physical units. Similar to NASA Level 2.

Since:1.0.0

Callisto

A second largest moon of Jupiter and the third-largest moon in the solar system.

Since:2.2.5

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.

Since:1.2.1

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.

Since:1.0.0

Catalog

A tabular listing of events or observational notes, especially those that have utility in aiding a user in locating data. Catalogs include lists of events, files in a product, and data availability. A Catalog resource is a type of "data product" which is a set of data that is uniformly processed and formatted, from one or more instruments, typically spanning the full duration of the observations of the relevant instrument(s). A data product may consist of a collection of granules of successive time spans, but may be a single high-level entity.

Since:1.0.0

Sub-elements

ResourceId
ResourceHeader
AccessInformation
ProviderName
ProviderResourceName
ProviderVersion
**Caveats**

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

Since: 1.0.0

Used by: [Spase](#)

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**CDF**

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

Since: 1.0.0

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**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.

Since: 1.0.0

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**CEF1**

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

Since: 1.0.0

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**CEF2**

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

Since: 1.0.0
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>

Since: 1.0.0

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.

Since: 1.0.0

Characteristic

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

Since: 1.2.1

ChargeFlux

The number of ionized particles passing through a unit area per unit time, for instance as measured by a Faraday cup.

Since: 2.3.2

ChargeState

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

Since: 2.0.2

Checksum

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.

Since: 1.2.0

Sub-elements

HashValue
HashFunction

Used by: Source

ChildEventOf

A descendant or caused by another resource.

Since: 1.3.6
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.
Since:1.0.0

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.
Since:1.0.0

ClassificationMethod
The technique used to determine the characteristics of an object.
Since:1.3.6

Allowed Values
- Automatic
- Inferred
- Inspection

Used by: Annotation

CLI
A command-line interface (CLI) is a form of interface where input to an application is provided as lines of text typically within a shell.
Since:2.4.0

CodeLanguage
A formal language, which comprises a set of instructions that produce various kinds of output.
Since:2.4.0

Used by: Software

Coherence
The coherence, $C_{xy}$, between two signals $x(t)$ and $y(t)$ is a real-valued function. The square of the coherence is defined by using: $C_{xy}^2 = \frac{|G_{xy}(f)|^2}{G_{xx}(f)G_{yy}(f)}$ where $G_{xy}(f)$ is equal to the cross-spectral density between two time series denoted as $x$ and $y$, respectively, and $G_{xx}(f)$ and $G_{yy}(f)$ are equal to the auto-spectral densities of the same two time series. Values of $C_{xy}$ always lie in the range between zero and one, $0 = C_{xy} \leq 1$, in accordance with the Cauchy-Schwarz inequality.
Since:2.3.2
An individual who is a scientific peer and major participant in an investigation.
Since:1.0.0

**ColorBar**

A spectrum or set of colors used to represent data values.
Since:2.2.0

**Column**

A two-dimensional measure of a quantity. The column is the area over which the quantity is measured.
Since:1.3.4

**Comet**

A relatively small extraterrestrial body consisting of a frozen mass that travels around the sun in a highly elliptical orbit.
Since:1.2.0

**Component**

Projection of a vector along one of the base axes of a coordinate system.
Since:1.0.0

*Allowed Values*
- I
- J
- K

**Confidence**

An expression of how certain that a quantity is valid or accurate.
Since:2.2.9

**ConfidenceRating**

A classification of the certainty of an assertion.
Since:1.3.4

*Allowed Values*
- Probable
- Strong
- Unlikely
- Weak

*Used by: Annotation*

**Contact**

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.
Since:1.0.0
Sub-elements **PersonID**
- **Role**
- **StartDate**
- **StopDate**
- **Note**

Used by: **ResourceHeader**

**Contributor**
An entity responsible for making contributions to the content of the resource.
Since: 1.3.0

**Convention**
A set of agreed, stipulated, or generally accepted approaches or methods of adopting a standard or implementing an approach.
Since: 2.4.0

**CoordinateRepresentation**
The method or form for specifying a given point or vector in a given coordinate system.
Since: 1.0.0

- **Allowed Values**
  - **Cartesian**
  - **Cylindrical**
  - **Spherical**

Used by: **CoordinateSystem**

**CoordinateSystem**
The specification of the orientation of a set of (typically) orthogonal base axes.
Since: 1.0.0

- **Sub-elements**
  - **CoordinateRepresentation**
  - **CoordinateSystemName**

Used by: **Parameter**

**CoordinateSystemName**
Identifies the coordinate system in which the position, direction or observation has been expressed.
Since: 1.0.0

- **Allowed Values**
  - **Carrington**
  - **CGM**
  - **CSO**
  - **DM**
  - **ECD**
  - **ECEF**
  - **ENP**
  - **GEI**
  - **GEO**
An individual who is peer of a principal investigator and is an administrative and scientific lead for an investigation.

Since: 2.3.1
Core
The central or main part of an object or calculated distribution. For example, the part of a
distribution of particles at low energies that is a thermal (Maxwellian) population.
Since:2.2.1

Cores
An application processor that is part of a CPU.
Since:2.4.0
Used by: ExecutionEnvironment

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.
Since:1.0.0

CoronalHole
An extended region of the corona, exceptionally low in density and associated with unipolar
photospheric regions. A coronal hole can be an "open" magnetic field in the corona and
(perhaps) inner heliosphere which has a faster than average outflow (wind); A region of lower
than "quiet" ion and electron density in the corona; or a region of lower peak electron
temperature in the corona than in the "quiet" corona.
Since:1.3.0

CoronalMassEjection
A solar event (CME) that involves a burst of plasma ejected into the interplanetary medium.
CME's may be observed remotely relatively near the sun or in situ in the interplanetary
medium. The latter type of observations are often referred to as Interplanetary CME's
(ICME's).
Since:1.0.0

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.
Since:1.2.1

CountRate
The number of events per unit time.
Since:1.3.1

Counts
The number of detection events occurring in a detector over the detector accumulation time.
CrossSpectrum
The Fourier transform of the cross correlation of two physical or empirical observations.
  Since:1.0.0

CSO
Corrected Solar Orbital - A coordinate system related to Earth where X is anti-sunward, Y along the orbital velocity direction.
  Since:2.2.5

CSV
Comma Separated Value - A data exchange format defined by RFC 4180.
  Since:2.2.7

Current
The flow of electrons through a conductor caused by a potential difference.
  Since:1.2.1

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.
  Since:1.0.0

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.
  Since:1.3.1

DataExtent
The area of storage in a file system required to store the contents of a resource. The default units for data extent is bytes.
  Since:1.2.0

  Sub-elements Quantity
    Units
    Per

  Used by: AccessInformation
    Source

DataProducer

An individual who generated the resource and is familiar with its provenance.
Since: 1.0.0

**DataQuality**
An ancillary parameter that denotes the standard or degree of accuracy, trustworthiness, or usefulness of another parameter.
Since: 2.3.1

**Deimos**
The smaller and outermost of the two natural satellites of Mars.
Since: 2.2.5

**DeputyPI**
An individual who is an administrative or scientific leader for an investigation operating under the supervision of a Principal Investigator.
Since: 1.2.0

**DerivedFrom**
A transformed or altered version of a resource instance.
Since: 1.3.3

**Description**
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.
Since: 1.0.0

Used by: [AccessURL](#), [InformationURL](#), [InputProperty](#), [OutputProperty](#), [Parameter](#), [ResourceHeader](#), [Structure](#)

**Developer**
The developer of a system to imitate a situation or process.
Since: 2.3.1

**Deviation**
The difference between an observed value and the expected value of a quantity.
Since: 1.0.0
Differential
A measurement within a narrow range of energy and/or solid angle.
Since:1.1.0

Dione
The forth-largest moon of Saturn.
Since:2.2.5

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.
Since:1.3.5

Directional
A measurement within a narrow range of solid angle.
Since:2.2.0

DirectionAngle
The angle between a position vector or measured vector (or one of its projections onto a plane) and one of the base axes of the coordinate system.
Since:2.3.1
   Allowed Values AzimuthAngle
                    ElevationAngle
                    PolarAngle

DirectionCosine
The cosine of the angle between two vectors usually between a vector and one of the basis axes defining a Cartesian coordinate system. Three angles and thus three direction cosines are required to define a vector direction in a three dimensional Euclidean space.
Since:1.3.5
   Allowed Values I
                    J
                    K

DisplayCadence
The time interval between the successive display elements.
Since:1.0.0
   Used by: DisplayData

DisplayData
A graphical representation of data wherein the underlying numeric values are not (readily)
accessible for analysis. Examples are line plots and spectrograms. A Display Data resource is a type of "data product" which is a set of data that is uniformly processed and formatted, from one or more instruments, typically spanning the full duration of the observations of the relevant instrument(s). A data product may consist of a collection of granules of successive time spans, but may be a single high-level entity.

Since:1.0.0

Sub-elements

<table>
<thead>
<tr>
<th>Sub-element</th>
</tr>
</thead>
<tbody>
<tr>
<td>ResourceID</td>
</tr>
<tr>
<td>ResourceHeader</td>
</tr>
<tr>
<td>AccessInformation</td>
</tr>
<tr>
<td>ProcessingLevel</td>
</tr>
<tr>
<td>ProviderName</td>
</tr>
<tr>
<td>ProviderResourceName</td>
</tr>
<tr>
<td>ProviderProcessingLevel</td>
</tr>
<tr>
<td>ProviderVersion</td>
</tr>
<tr>
<td>InstrumentID</td>
</tr>
<tr>
<td>MeasurementType</td>
</tr>
<tr>
<td>TemporalDescription</td>
</tr>
<tr>
<td>SpectralRange</td>
</tr>
<tr>
<td>DisplayCadence</td>
</tr>
<tr>
<td>ObservedRegion</td>
</tr>
<tr>
<td>Caveats</td>
</tr>
<tr>
<td>Keyword</td>
</tr>
<tr>
<td>InputResourceID</td>
</tr>
<tr>
<td>Parameter</td>
</tr>
<tr>
<td>Extension</td>
</tr>
</tbody>
</table>

Used by: Spase

DisplayType

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

Since:1.3.1

Allowed Values

<table>
<thead>
<tr>
<th>Allowed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image</td>
</tr>
<tr>
<td>Plasmagram</td>
</tr>
<tr>
<td>Spectrogram</td>
</tr>
<tr>
<td>StackPlot</td>
</tr>
<tr>
<td>TimeSeries</td>
</tr>
<tr>
<td>WaveForm</td>
</tr>
</tbody>
</table>

Used by: RenderingHints

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>

Since:1.0.0
### Document

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

Since: 1.3.0

Sub-elements
- **ResourceID**
- **ResourceHeader**
- **AccessInformation**
- **Keyword**
- **DocumentType**
- **MIMEType**
- **InputResourceID**

Used by: **Spase**

### DocumentType

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

Since: 1.3.0

Allowed Values
- **Convention**
- **Other**
- **Policy**
- **Poster**
- **Presentation**
- **Report**
- **Specification**
- **TechnicalNote**
- **WhitePaper**

Used by: **Document**

### DOI

A digital object identifier (DOI) is a unique alphanumeric string assigned by a registration agency (the International DOI Foundation) to identify content and provide a persistent link to its location on the Internet.

Since: 2.3.0

Used by: **ResourceHeader**

### DopplerFrequency

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

Since: 1.3.5

### Dopplergram

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

Since: 1.0.0
DoubleSphere
A dipole antenna of which the active (sensor) elements are small spheres located at the ends of two wires deployed in the equatorial plane, on opposite sides of a spinning spacecraft.
Since:1.0.0

DRegion
The layer of the ionosphere that exists approximately 50 to 95 km above the surface of the Earth. One of several layers in the ionosphere.
Since:1.2.0

DriftMotion
The third invariant for charged particle motion in a dipolar magnetic field is associated with drift of its guiding center in the equatorial plane. The conserved quantity, $J_{2}$, is equal to $q\Phi$; where $q$ is the particle charge and $\Phi$ is the magnetic flux enclosed within the particle drift path.
Since:2.3.1

Dust
Free microscopic particles of solid material.
Since:1.0.0

DustDetector
An instrument which determines the mass and speed of ambient dust particles.
Since:1.3.1

DynamicPressure
Dynamic pressure is a measure of the kinetic energy per unit volume of a fluid. For instance, the solar wind dynamic pressure or ram pressure for a purely proton plasma is equal to $m_p n V^2$ where $m_p$ is the proton mass, $n$ the proton number density, and $V$ the solar wind speed.
Since:2.3.2

Earth
The third planet from the sun in our solar system.
Since:1.1.0

Allowed Values
- Magnetosheath
- Magnetosphere
- Magnetosphere.Magnetotail
- Magnetosphere.Main
- Magnetosphere.Plasmasphere
- Magnetosphere.Polar
ECD

Eccentric Dipole (ECD) coordinate system that aligns with a dipole whose origin and orientation may be different from the physical center and spin axis of the containing body. The IGRF-12 coefficients for 2015 are used to determine the origin for the earth. The 2015 positions are North dip pole: latitude: 86.29, longitude -160.06. South dip pole latitude: -64.28, longitude: 136.59, North geometric pole latitude: 80.37, longitude: -72.63, South geomagnetic pole latitude: -80.37, longitude: 107.37. ECD is defined in doi:10.1186/s40623-015-0228-9.

Since:2.3.1

ECEF

The Earth-Centered, Earth-Fixed (ECEF) coordinate system has point (0,0,0) defined as the center of mass of the Earth. Its axes are aligned with the International Reference Pole (IRP) and International Reference Meridian (IRM). The x-axis intersects the sphere of the Earth at 0 degree latitude (Equator) and 0 degree longitude (Greenwich). The z-axis points north. The y-axis completes the right handed coordinate system.

Since:2.2.3

EITWave

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

Since: 1.3.0

<table>
<thead>
<tr>
<th>Item</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>The physical attribute that exerts an electrical force.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>ElectricField</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Electromagnetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.3.5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Electron</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>ElectronDriftInstrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Electrostatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collective longitudinal electric-field and plasma oscillations trapped within a body of plasma.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.3.5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>ElectrostaticAnalyser</th>
</tr>
</thead>
<tbody>
<tr>
<td>An instrument which uses charged plates to analyze the mass, charge and kinetic energies of charged particles which enter the instrument.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Container</th>
<th>Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>A component or individual unit of a multiple value quantity such as an array or vector.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.2.0</td>
<td></td>
</tr>
<tr>
<td>Sub-elements</td>
<td>Name</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Used by:</td>
<td><strong>Structure</strong></td>
</tr>
<tr>
<td><strong>Elevation</strong></td>
<td></td>
</tr>
<tr>
<td>The distance in meters above (positive) or below (negative) the &quot;zero elevation&quot; defined by the World Geodetic System reference frame (WGS84).</td>
<td></td>
</tr>
<tr>
<td>Since: 1.2.0</td>
<td></td>
</tr>
<tr>
<td>Used by:</td>
<td><strong>Location</strong></td>
</tr>
<tr>
<td><strong>ElevationAngle</strong></td>
<td></td>
</tr>
<tr>
<td>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})).</td>
<td></td>
</tr>
<tr>
<td>Since: 1.2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Email</strong></td>
<td></td>
</tr>
<tr>
<td>The electronic address at which the individual may be contacted expressed in the form &quot;local-part@domain&quot;.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
<tr>
<td>Used by:</td>
<td><strong>Person</strong></td>
</tr>
<tr>
<td><strong>Emissivity</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Enceladus</strong></td>
<td></td>
</tr>
<tr>
<td>The sixth-largest moon of Saturn. It is currently endogenously active. The smallest known body in the Solar System that is geologically active today.</td>
<td></td>
</tr>
<tr>
<td>Since: 2.2.5</td>
<td></td>
</tr>
<tr>
<td><strong>EncodedParameter</strong></td>
<td></td>
</tr>
<tr>
<td>A variable that uses successive bits to encode, this is bitwise encode, a set of conditions by using a compositied multibit numeric value. A common example is a bitwise encoded flag that denotes whether various possible errors that may affect a particular measurement. For example, a bit value equal to zero may indicate the absence of a particular error condition</td>
<td></td>
</tr>
</tbody>
</table>
while a value equal to one would indicate the possibility that the associated datum should be ignored or used with caution due to the same error categorization.

Since: 2.3.2

**Encoding**

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

Since: 1.0.0

Allowed Values:
- ASCII
- Base64
- BZIP2
- GZIP
- None
- S3_BUCKET
- TAR
- Unicode
- ZIP

Used by: **AccessInformation**

**EnergeticParticleInstrument**

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

Since: 1.0.0

**EnergeticParticles**

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

Since: 1.0.0

**EnergeticSolarParticleEvent**

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

Since: 1.0.0

**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)

Since: 1.0.0

**EnergyDensity**

The amount of energy per unit volume.

Since: 1.2.1
**EnergyFlux**
The amount of energy passing through a unit area in a unit time.

Since: 1.2.1

**EnergyPerCharge**
The kinetic energy, $E$, per unit net charge, $q$, that is $E/q$, for an electron or an ionized atom, molecule, or dust particle.

Since: 2.3.2

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

Since: 1.1.0

Sub-elements
- Low
- High
- Units
- Bin

Used by: Particle, Wave

**ENP**
ENP (also called PEN) - The P vector component points northward, perpendicular to orbit plane which for a zero degree inclination orbit is parallel to Earth's spin axis. The E vector component is perpendicular to P and N and points earthward. The N component is perpendicular to P and E and is positive eastward.

Since: 2.2.3

**Entropy**
A function of thermodynamic quantity, such as temperature, pressure, or composition, that is a measure of the energy that is not available for work during a thermodynamic process. It is often interpreted as the degree of disorder or randomness in the system.

Since: 2.2.9

**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.

Since: 1.2.0

**EPNTAP**
Europlanet (EPN) Table Access Protocol (TAP) is a framework, which is using TAP with the EPNcore metadata dictionary. The EPNcore metadata dictionary defines the core components that are necessary to perform data discovery in the Solar System related science fields. https://github.com/ivoa-std/EPNTAP
EquatorialRegion

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

Since:1.2.0

EquivalentWidth

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

Since:1.0.0

ERegion

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

Since:1.2.0

Europa

The sixth-closest round moon of Jupiter.

Since:2.2.5

Event

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

Since:1.3.4

Excel

A Microsoft spreadsheet format used to hold a variety of data in tables which can include calculations.

Since:2.2.0

Experiment

A collection of components which are designed to make coordinated observations of a phenomenon or object. Projects and missions may refer to an 'experiment' by other names like 'suite'.

Since:2.3.2

ExpirationDate

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.

Since:1.2.0
Used by: [Granule](#)
[ResourceHeader](#)

**Exposure**

The time interval over which an individual measurement is taken.

Since: 1.0.0

Used by: [TemporalDescription](#)

**ExposureMax**

The largest interval over which an individual measurement is taken.

Since: 2.2.9

Used by: [TemporalDescription](#)

**ExposureMin**

The smallest time interval over which an individual measurement is taken.

Since: 2.2.9

Used by: [TemporalDescription](#)

**Extension**

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.

Since: 1.2.0

Used by: [Annotation](#)
[Catalog](#)
[DisplayData](#)
[Instrument](#)
[NumericalData](#)
[Observatory](#)
[Person](#)
[Registry](#)
[Repository](#)
[Service](#)

**ExtremeUltraviolet**

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

Since: 1.2.1

**FaradayCup**

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

Since: 1.0.0
<table>
<thead>
<tr>
<th><strong>FarUltraviolet</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A spectrum with a wavelength range of 122 nm to 200.0 nm. VSO nickname: FUV image with a range of 122.0 nm to 200 nm</td>
<td>Since: 1.3.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FaxNumber</strong></th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Since: 1.2.1</td>
</tr>
<tr>
<td>Used by: Person</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Feature</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A prominent or distinctive characteristic that occurs at a location or persists over a period of time.</td>
<td>Since: 1.3.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Field</strong></th>
<th>Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>The space around a radiating body within which its electromagnetic attributes can exert force on another similar body that is not in direct contact.</td>
<td>Since: 1.0.0</td>
</tr>
<tr>
<td>Sub-elements Qualifier</td>
<td></td>
</tr>
<tr>
<td>FieldQuantity</td>
<td></td>
</tr>
<tr>
<td>FrequencyRange</td>
<td></td>
</tr>
<tr>
<td>Used by: Parameter</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FieldAligned</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>The component of a quantity which is oriented in the same direction of a field.</td>
<td>Since: 1.3.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FieldQuantity</strong></th>
<th>Enumeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>The physical attribute of the field.</td>
<td>Since: 1.1.0</td>
</tr>
<tr>
<td>Allowed Values Current Electric Electromagnetic Gyrofrequency Magnetic PlasmaFrequency Potential PoyntingFlux</td>
<td></td>
</tr>
<tr>
<td>Used by: Field</td>
<td></td>
</tr>
</tbody>
</table>

| **File** | Item |
Access to a file containing the data.
Since:2.3.0

**FillValue**

A value that indicates that a quantity is undefined.
Since:1.2.0
Used by: **Element**
**Parameter**

**Film**

An image recording medium on which usually a "negative" analog image is registered. A "positive" image can be recovered or reproduced from film, which is usually made of flexible materials for ease of storage and transportation.
Since:2.2.0

**Fit**

Values that make an model agree with the data.
Since:1.0.0

**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.
Since:1.0.0

**FlowSpeed**

The rate at which particles or energy is passing through a unit area in a unit time.
Since:1.2.1

**FlowVelocity**

The volume of matter passing through a unit area perpendicular to the direction of flow in a unit of time.
Since:1.3.1

**Fluence**

The time integral of a flux. A fluence does not have any "per unit time" in its units.
Since:2.2.0

**FluxFeedback**

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

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

**Format**

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
- CEF1
- CEF2
- CSV
- Excel
- FITS
- GIF
- Hardcopy
- Hardcopy.Film
- Hardcopy.Microfiche
- Hardcopy.Microfilm
- Hardcopy.Photograph
- Hardcopy.PhotographicPlate
- Hardcopy.Print
- HDF
- HDF4
- HDF5
- HTML
- IDFS
- IDL
- JPEG
- JSON
- MATLAB_4
- MATLAB_6
- MATLAB_7
- MPEG
- NCAR
- NetCDF
- PDF
Used by: AccessInformation

**FormerPI**

An individual who had served as the administrative and scientific lead for an investigation, but no longer assumes that role.

Since: 2.0.3

**FourierTransformSpectrograph**

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

Since: 1.0.0

**FRegion**

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

Since: 1.2.0

**Frequency**

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

Since: 1.3.5

**FrequencyRange**

The range of possible values for the observed frequency.

Since: 1.1.0

Sub-elements: SpectralRange

Low
High Units Bin

Used by: Field Wave

**FrequencyToGyrofrequencyRatio**

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

Since: 1.3.6

**Funding**

The source of financial support (funding) for the resource.

Since: 2.3.0

Sub-elements: Agency, Project, AwardNumber

Used by: ResourceHeader

**GammaRays**

Photons with a wavelength range: 0.00001 to 0.001 nm

Since: 1.0.0

**Ganymede**

The biggest moon of Jupiter and in the solar system.

Since: 2.2.5

**GEI**

GEI Geocentric Equatorial Inertial - A coordinate system where the Z axis is along Earth's spin vector, positive northward. X axis points towards the first point of Aries (from the Earth towards the Sun at the vernal equinox). See Russell, 1971. When the X axis is the direction of the mean vernal equinox of J2000, the coordinate system is also called GCI. Then the Z axis is also defined as being normal to the mean Earth equator of J2000.

Since: 1.0.0

**GeigerMuellerTube**

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

Since: 1.2.1

**GeneralContact**

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

Since: 1.0.0
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.
Since:1.0.0

GeomagneticStorm
A magnetospheric disturbance typically defined by variations in the horizontal component of the Earth's surface magnetic field. The variation typically starts with a field enhancement associated with a solar wind pressure pulse and continues with a field depression associated with an enhancement of the diamagnetic magnetospheric ring current.
Since:1.0.0

GeometricFactor
A measure of the gathering power of a particle detector. The geometric factor can be used to correct particle measurements by accounting for the fact that only a fraction of source particles are able to gain entry through the aperture of a detector. For an isotopic source distribution, the geometric factor corresponds to the solid angle subtended by the aperture. In practice, determination of the geometric factor requires numerical modeling and depends on detector design and the characteristics of the source.
Since:2.3.1

GIF
Graphic Interchange Format (GIF) first introduced in 1987 by CompuServe. GIF uses LZW compression and images are limited to 256 colours.
Since:1.0.0

Git
Git is a version control system for tracking changes in any set of files. It is known for its speed, data integrity, and support for distributed, non-linear workflows.
Since:2.4.1

GPHIO
Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.
Since:2.2.5

Granule
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.

Since: 1.1.0

Sub-elements
- **ResourceId**
- **ReleaseDate**
- **ExpirationDate**
- **ParentID**
- **PriorID**
- **StartDate**
- **StopDate**
- **Source**

Used by: **Spase**

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

Since: 1.3.6

**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.

Since: 1.0.0

**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.

Since: 1.0.0

**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.

Since: 1.0.0

**GUI**
A graphical user interface (GUI) is a form of user interface that allows users to interact with an application through graphical icons, forms and other elements with both a keyboard and a pointing device.

Since: 2.4.0

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

Since: 1.2.1
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/>
Since:1.0.0

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.
Since:1.0.0

Halo
The part of an object or distribution surrounding some central body or distribution. For example, the particles above the core energies that show enhancements above the thermal population. Typically, a "power law tail" shows a break from the core Maxwellian at a particular energy.
Since:2.2.1

Halpha
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.
Since:1.2.1

HAPI
A Heliophysics Application Programmer Interface (HAPI) specification compliant access point.
Since:2.3.0

Hardcopy
A permanent reproduction, or copy in the form of a physical object, of any media suitable for direct use by a person.
Since:2.2.0
Allowed Values
- Film
- Microfiche
- Microfilm
- Photograph
- PhotographicPlate
- Print

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

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

HCC
Heliocentric Cartesian - A 3-D orthonormal coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points toward the observer. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Standard representation for this system is via the point's x and y values, expressed either as physical distances or as fractions of the solar disk radius.

HCR
Heliocentric Radial - A 3-D orthonormal coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points toward the observer. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Standard representation for this system is via the point's distance rho from the Z axis \(\text{Rho} = \sqrt{x^2 + y^2}\) and its phase angle psi measured counterclockwise from the +Y axis \(\text{psi} = \arctan(-y/x)\).
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDF4</td>
<td>Hierarchical Data Format, Version 4</td>
</tr>
<tr>
<td></td>
<td>Since: 1.0.0</td>
</tr>
<tr>
<td>HDF5</td>
<td>Hierarchical Data Format, Version 5</td>
</tr>
<tr>
<td></td>
<td>Since: 1.0.0</td>
</tr>
<tr>
<td>He10830</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Since: 1.2.1</td>
</tr>
<tr>
<td>He304</td>
<td>A spectrum centered around the resonance line of ionised helium at 304 Angstrom (30.4 nm).</td>
</tr>
<tr>
<td></td>
<td>Since: 1.3.5</td>
</tr>
<tr>
<td>HeatFlux</td>
<td>Flow of thermal energy through a gas or plasma; typically computed as third moment of a distribution function.</td>
</tr>
<tr>
<td></td>
<td>Since: 1.0.0</td>
</tr>
<tr>
<td>HEE</td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>Since: 1.0.0</td>
</tr>
<tr>
<td>HEEQ</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Since: 1.0.0</td>
</tr>
<tr>
<td>Heliosheath</td>
<td>The region extending radially outward from the heliospheric termination shock and in which the decelerated solar wind plasma is still significant.</td>
</tr>
<tr>
<td></td>
<td>Since: 2.2.0</td>
</tr>
<tr>
<td>Heliosphere</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Enumeration**
Since: 1.0.0

Allowed Values

Heliosheath
Inner
NearEarth
Outer
Remote1AU

**HERTN**

Helio-Ecliptic Radial Tangential Normal coordinate system. Typically centered at a spacecraft. The X axis (radial) is set as the primary axis, and is defined as the axis pointing from the spacecraft to the Sun. The Z axis (tangential) is set as the secondary axis, and is defined as that portion of the ecliptic rotational axis which is perpendicular to the primary axis. The Y axis (Normal) is defined as Z cross X.

Since: 2.2.9

**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>

Since: 1.0.0

**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>

Since: 1.0.0

**HGRTN**

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

Since: 2.2.9

**High**

The largest value within a range of possible values.

Since: 1.1.0

Used by: AzimuthalAngleRange
Bin
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Since:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EnergyRange</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FrequencyRange</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MassRange</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PitchAngleRange</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PolarAngleRange</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WavelengthRange</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Horizontal</strong></td>
<td>Parallel to or in the plane of the horizon or a base line.</td>
<td>2.2.0</td>
</tr>
<tr>
<td><strong>HostContact</strong></td>
<td>An individual who can provide specific information with regard the hosting of a resource or supporting software.</td>
<td>2.3.1</td>
</tr>
<tr>
<td><strong>Housekeeping</strong></td>
<td>Parameters that indicate the status or health state of instruments or monitoring devices as measured in physical units such as that for current, voltage, or temperature. Housekeeping data can be analyzed to determine whether instruments are working correctly and the knowledge of their values may be used to avoid errors or even device failures.</td>
<td>2.3.2</td>
</tr>
<tr>
<td><strong>HPC</strong></td>
<td>Helioprojective Cartesian = A 3-D orthonormal (left-handed) coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points from the observer to the center of the solar disk. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Given as the distance between the observer and the center of the solar disk, the standard representation of an (x,y) point on the solar disk is via the point's longitude angle [\arctan (x/d)] and latitude angle [\arctan y/d].</td>
<td>2.2.0</td>
</tr>
<tr>
<td><strong>HPR</strong></td>
<td>Helioprojective Radial - A 3-D orthonormal (left-handed) coordinate system that is primarily intended to specify with two dimensions a point on the solar disk. The Z axis points from the observer to the center of the solar disk. The Y axis lies in the plane defined by the solar spin vector and the Z axis, positive northward. The X axis is perpendicular to the Y and Z axes, positive toward solar west. Given as the distance between the observer and the center of the solar disk, the standard representation for this system of an (x,y) point on the solar disk is via the point's latitude angle [\theta = \arctan \sqrt{x^2 + y^2}/d] or equivalent declination parameter [\delta = \theta - 90\ deg], and its phase angle [\psi] as measured counter-clockwise from the +Y axis [\psi = \arctan (-y/x)].</td>
<td>2.2.0</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Since</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>HSM</td>
<td>Heliospheric Solar Magnetospheric - A coordinate system where the X axis is from Earth to Sun, Z axis is northward in a plane containing the X axis and the geomagnetic dipole axis.</td>
<td>2.2.5</td>
</tr>
<tr>
<td>HTML</td>
<td>A text file containing structured information represented in the HyperText Mark-up Language (HTML). See &lt;<a href="http://www.w3.org/MarkUp/">http://www.w3.org/MarkUp/</a>&gt;</td>
<td>1.0.0</td>
</tr>
<tr>
<td>Hydrodynamic</td>
<td>Periodic or quasi-periodic oscillations of fluid quantities.</td>
<td>1.3.5</td>
</tr>
<tr>
<td>I</td>
<td>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.</td>
<td>1.3.4</td>
</tr>
<tr>
<td>Iapetus</td>
<td>The third-largest moon of Saturn and the eleventh-largest in the Solar System.</td>
<td>2.2.5</td>
</tr>
<tr>
<td>IDFS</td>
<td>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).</td>
<td>1.0.0</td>
</tr>
<tr>
<td>IDL</td>
<td>Interactive Data Language (IDL) save set. IDL is a proprietary format.</td>
<td>1.0.0</td>
</tr>
<tr>
<td>IJ</td>
<td>A measure of the length of a position or measured vector projected into the i-j (typically X-Y) plane of the coordinate system.</td>
<td>1.3.4</td>
</tr>
<tr>
<td>IK</td>
<td>A measure of the length of a position or measured vector projected into the i-k (typically X-Z) plane of the coordinate system.</td>
<td></td>
</tr>
</tbody>
</table>
**Image**
A two-dimensional representation of data with values at each element of the array related to an intensity or a color.  
Since: 1.3.1

**ImageIntensity**
Measurements of the two-dimensional distribution of the intensity of photons from some region or object such as the Sun or the polar auroral regions; can be in any wavelength band, and polarized, etc.  
Since: 1.0.0

**Imager**
An instrument which samples the radiation from an area at one or more spectral ranges emitted or reflected by an object.  
Since: 1.0.0

**ImageURL**
A URL to graphic, image or movie.  
Since: 1.3.5  
Used by: Annotation

**ImaginaryPart**
Any number $z$ can in general be represented by its complex form with $z = a + ib$ where $i$, which is defined as the square root of -1, signifies the imaginary component of the number $z$. The coefficient $b$ is called the imaginary part of the complex number $z$.  
Since: 2.3.2

**ImagingSpectrometer**
An instrument which is a multispectral scanner with a very large number of channels (64-256 channels) with very narrow band widths.  
Since: 1.2.1

**IMFClockAngle**
The clockwise angle of the direction of interplanetary magnetic field (IMF) measured in the plane of the body pole perpendicular to the line between the body and the Sun.  
Since: 2.2.4

**Index**
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.

Since:1.2.0
Used by: Element
          RenderingHints

Inferred
Determined by the analysis of other information or resources.

Since:1.3.6

InformationURL
Attributes of the method of acquiring additional information.

Since:1.0.0
Sub-elements Name
          URL
          Description
          Language

Used by: ResourceHeader

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

Since:1.0.0

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

Since:1.0.0

InputProperty
A container of attributes regarding an input property of an application.

Since:2.4.0
Sub-elements Name
          Description
          Caveats
          Units
          ValidMin
          ValidMax

Used by: Software

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

Since:1.0.0
Inspection

Determined by the analysis or assessment performed by a person.
Since: 1.3.6

Installer

A piece of software that installs a program or package on a system.
Since: 2.4.0

Sub-elements Availability, AccessRights, Acknowledgement, URL

Used by: ExecutionEnvironment

Instrument

A device that makes measurements used to characterize a physical phenomenon, or a family of like devices.
Since: 1.0.0

Sub-elements ResourceID, ResourceHeader, InstrumentType, InstrumentGroupID, InvestigationName, OperatingSpan, ObservatoryID, Caveats, Extension

Used by: Space

InstrumentGroupID

The identifier of an Instrument resource which the referring resource is a member of.
Since: 2.3.2

Used by: Instrument

InstrumentID

The identifier of an Instrument resource.
Since: 1.0.0

Used by: Catalog, DisplayData, NumericalData
**InstrumentLead**

An individual who is the designated leader of an instrument or instrument package.

Since: 2.3.2

**InstrumentMode**

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

Since: 2.0.2

**InstrumentScientist**

A scientist associated with a science instrument team with special familiarity and expertise on specific aspects of the design and operations of the instrument and the responsibility of ensuring the instrument's measurement capability.

Since: 2.4.1

**InstrumentStatus**

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

Since: 1.2.0

**InstrumentType**

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.

Since: 1.0.0

**Allowed Values**

- Antenna
- Channeltron
- Coronograph
- DoubleSphere
- DustDetector
- ElectronDriftInstrument
- ElectrostaticAnalyser
- EnergeticParticleInstrument
- Experiment
- FaradayCup
- FluxFeedback
- FourierTransformSpectrograph
- GeigerMuellerTube
- Imager
- ImagingSpectrometer
- Interferometer
- IonChamber
- IonDrift
- IonGauge
A flux measurement in a broad range of energy and solid angle.

Since: 1.1.0

Allowed Values: Area, Bandwidth, SolidAngle

The measurement of radiant or wave energy per unit detector area per unit bandwidth per unit solid angle per unit time.
<table>
<thead>
<tr>
<th><strong>Interferometer</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>An instrument to study the properties of two or more waves from the pattern of interference created by their superposition.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.2.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Interior</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>The region inside the body which is not visible from outside the body.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>InterplanetaryShock</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A shock propagating generally anti-sunward through the slower solar wind, often seen in front of CME-associated plasma clouds.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Interstellar</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>The region between stars outside of the star's heliopause.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.3.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>InvestigationName</strong></th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 &quot;Investigation&quot; for the purposes of data archiving.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
<tr>
<td>Used by: Instrument</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Io</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>The innermost of the four round moons of the planet Jupiter.</td>
<td></td>
</tr>
<tr>
<td>Since: 2.2.5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Ion</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>An atom that has acquired a net electric charge by gaining or losing one or more electrons. (Note: Z&gt;2)</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>IonChamber</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Since: 1.3.4</td>
<td></td>
</tr>
</tbody>
</table>
**IonComposition**

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

Since: 1.0.0

**IonDrift**

A device which measures the current produced by the displacement of ambient ions on a grid, thereby allowing the determination of the ion trajectory and velocity.

Since: 1.3.1

**IonGauge**

A device which measures low-pressure or vacuum neutral gas with pressures ranging from 10e-3 Torr to 10e-10 Torr. An ion gauge is an electronic amplifying vacuum tube consisting of three electrodes inside an evacuated glass envelope, with the filament being the cathode.

Since: 2.3.1

**Ionosphere**

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

Since: 1.1.0

Allowed Values
- DRegion
- ERegion
- FRegion
- Topside

**Irradiance**

Irradiance - A radiometric term for the power of electromagnetic radiation at a surface, per unit area. "Irradiance" is used when the electromagnetic radiation is incident on the surface. Irradiance data may be reported in any units (i.e. counts/s) due to, for example, being at a particular wavelength, or to being a not-fully-calibrated relative measurement.

Since: 1.0.0

**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.

Since: 1.3.4

**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.
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.
Since:1.3.4

JPEG
A binary format for still images defined by the Joint Photographic Experts Group
Since:1.0.0

JSM
Jovian Solar Magnetospheric - A coordinate system related to Jupiter where the X axis is from Jupiter to Sun, Z axis is northward in a plane containing the X axis and the Jovian dipole axis.
Since:2.2.4

JSO
Jovian Solar Orbital - A coordinate system related to Jupiter where X anti-sunward, Y along the orbital velocity direction.
Since:2.2.4

JSON
Javascript Object Notation - A lightweight data-interchange format.
Since:2.2.7

Jupiter
The fifth planet from the sun in our solar system.
Since:1.2.0
Allowed Values
- Callisto
- Europa
- Ganymede
- Io
- Magnetosphere
- Magnetosphere.Magnetotail
- Magnetosphere.Main
- Magnetosphere.Plasmasphere
- Magnetosphere.Polar
- Magnetosphere.RadiationBelt
- Magnetosphere.RingCurrent
**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.

Since: 1.3.4

**K7699**

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

Since: 1.2.1

**Keyword**

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

Since: 1.0.0

Used by: Catalog, DisplayData, Document, NumericalData

**KSM**

Kronian Solar Magnetospheric - A coordinate system related to Saturn where the X axis is anti-sunward, Z axis is northward in a plane containing the X axis and the Kronian dipole axis.

Since: 2.2.4

**KSO**

Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.

Since: 2.2.4

**LangmuirProbe**

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

Since: 1.0.0

**Language**

The two character indicator of language selected from the ISO 639-1 codes for the representation of names of languages.

Since: 1.3.0

Used by: AccessURL, InformationURL

**Latitude**

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

Since: 1.2.0

Used by: Location

**Layout**

The structured arrangement of items in a collection.

Since: 1.3.1

**LBHBand**

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

Since: 1.3.5

**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)

Since: 1.0.0

**Linear**

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

Since: 1.0.0

**LinearScale**

Intervals which are equally spaced.

Since: 1.3.4

**Line Depth**

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

Since: 1.0.0

**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.

Since: 1.0.0

**Listing**

A listing of files - either through FTP or HTTP.
Location
A position in space definable by a regional referencing system and geographic coordinates.
Since: 1.2.0
Sub-elements
- ObservatoryRegion
- CoordinateSystemName
- Latitude
- Longitude
- Elevation
Used by: Observatory

LogScale
Intervals which are spaced proportionally to the logarithms of the values being represented.
Since: 1.3.4

Longitude
The angular distance measured west (positive) or east (negative) from a north-south line called the Prime Meridian.
Since: 1.2.0
Used by: Location

LongWire
A dipole antenna whose active (sensor) elements are two wires deployed in the equatorial plane on opposite sides of a spinning spacecraft, and whose length is several times greater than the spacecraft diameter.
Since: 1.0.0

Low
The smallest value within a range of possible values.
Since: 1.1.0
Used by: AzimuthalAngleRange
- Bin
- EnergyRange
- FrequencyRange
- MassRange
- PitchAngleRange
- PolarAngleRange
- WavelengthRange

LowerHybridFrequency
Lower hybrid oscillations involve longitudinal motions of electrons and ions in a magnetized plasma. The propagation of lower hybrid waves must be close to perpendicular to the background magnetic field in so that electrons cannot move along field lines thus preventing wave growth. The lower hybrid frequency, $\Phi_{LH}$, can be calculated by using
\[ \Phi_{LH} = \left( \Omega_{ce} \Omega_{ci} \right)^{-1} + \Phi_{pi}^{-2} \right)^{-1/2} \]

where \( \Omega_{ce} \) and \( \Omega_{ci} \) are the electron and ion cyclotron frequencies, respectively, and \( \Phi_{LH} \) is the ion plasma frequency.

**LShell**

The L-Shell is the magnetic equatorial radius (in units of planetary radii) of a dipole magnetic field line. For instance, if the L-shell value equals 6 say at Earth, the magnetic field lines cross the magnetic equator at six Earth radii. The L-shell concept can be applied generally to any magnetized planet or satellite with a dominant dipolar magnetic field moment.

**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 \( \mathbf{N} \) 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 \( \mathbf{Y} = \mathbf{N} \times \mathbf{Z}, \mathbf{X} = \mathbf{Y} \times \mathbf{Z} \). See Russell, 1971, and [http://cdpp.cnes.fr/00428.pdf](http://cdpp.cnes.fr/00428.pdf)

**Magnetic**

The physical attribute attributed to a magnet or its equivalent.

**MagneticCloud**

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

**MagneticField**

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

**MagneticMoment**

A constant of motion related to the gyromotion of a particle in a magnetic field that is either static or slowly varying with respect to the gyroperiod. The magnetic moment is usually denoted by using the lower case Greek letter for mu, \( \mu \), and can be calculated by using \( \mu = m u^2/2B \) where \( m \) is the particle mass, \( u \) is the velocity of the particle perpendicular to the constant or average magnetic field direction, and \( B \) is the magnitude of the magnetic field strength.
<table>
<thead>
<tr>
<th><strong>Magnetogram</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>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. (&quot;Magnetogram.&quot;)</td>
<td>Since: 1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Magnetograph</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A special type of magnetometer that records a time plot of the local magnetic field near the instrument; or a telescope capable of determining the magnetic field strength and/or direction on a distant object such as the Sun, using the Zeeman splitting or other spectral signatures of magnetization.</td>
<td>Since: 2.2.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Magnetometer</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>An instrument which measures the ambient magnetic field.</td>
<td>Since: 1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MagnetopauseCrossing</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A crossing of the interface between the shocked solar wind in the magnetosheath and the magnetic field and plasma in the magnetosphere.</td>
<td>Since: 1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Magnetosheath</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>The region between the bow shock and the magnetopause, characterized by very turbulent plasma.</td>
<td>Since: 1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MagnetosonicMachNumber</strong></th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ratio of the velocity of fast mode waves to the Alfven velocity.</td>
<td>Since: 1.3.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Magnetosphere</strong></th>
<th>Enumeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Since: 1.0.0</td>
</tr>
<tr>
<td>Allowed Values</td>
<td>Magnetotail, Main, Plasmasphere, Polar, RadiationBelt, RingCurrent</td>
</tr>
</tbody>
</table>
Magnetotail

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

Since:1.0.0

Magnitude

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

Since:1.0.0

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.

Since:1.0.0

Mars

The forth planet from the sun in our solar system.

Since:1.2.0


Mass

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

Since:1.0.0

MassDensity

The mass of particles per unit volume.

Since:1.0.0

MassNumber

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

Since:2.0.2
**MassPerCharge**

The mass, m, per unit net charge, q, that is m/q, for an electron or an ionized atom, molecule, or dust particle.

Since: 2.3.2

**MassRange**

The range of possible mass for a group of particle observations.

Since: 2.2.9

Sub-elements **Low**

**High**

**Units**

**Bin**

Used by: **Particle**

**MassSpectrometer**

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

Since: 1.0.0

**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.

Since: 1.1.0

**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.

Since: 1.1.0

**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.

Since: 1.1.0

**Maximum**

The largest value of a batch or sample or the upper bound of a probability distribution.

Since: 2.2.0

**MD5**

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

The enumeration of the specific measurement target (e.g., energetic particles, ion composition, etc.), method of measurement (e.g., Interferometry), or the particular compilation of measurements (e.g., a composite dataset consisting of measurements from multiple instruments or platforms, such as Dopplergram, keogram, ElectronColumnDensity (TEC), etc.) that reflect a richer context (e.g., structure and dynamics) of the observational target.

Since: 1.2.0

Allowed Values

- ActivityIndex
- Dopplergram
- Dust
- ElectricField
- EnergeticParticles
- Ephemeris
- ImageIntensity
- InstrumentStatus
- IonComposition
- Irradiance
- MagneticField
- Magnetogram
- NeutralAtomImages
- NeutralGas
- Profile
- Radiance
- Spectrum
- SPICE
- ThermalPlasma
- Waves
- Waves.Active
- Waves.Passive

Used by:

- DisplayData
- NumericalData

Median

The measure of central tendency of a set of n. values computed by ordering the values and taking the value at position \((n. + 1) / 2\) when n. is odd or the arithmetic mean of the values at positions \(n. / 2\) and \((n. / 2) + 1\) when n. is even.

Since: 2.2.0

Memory

The component of your computer that allows you to store and access data on a short-term basis, typically the amount of RAM. Indicate units with standard byte scales such as KB, MB, GB, TB and PB.
Mercury
The first planet from the sun in our solar system.

Allowed Values
- Magnetosphere
  - Magnetosphere.Magnetotail
  - Magnetosphere.Main
  - Magnetosphere.Plasmasphere
  - Magnetosphere.Polar
  - Magnetosphere.RadiationBelt
  - Magnetosphere.RingCurrent

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

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

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>

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

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

Microfiche
A sheet of microfilm on which many pages of material have been photographed; a magnification system is used to read the material.
<table>
<thead>
<tr>
<th><strong>Microfilm</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Film rolls on which materials are photographed at greatly reduced size; a magnification system is used to read the material.</td>
<td>Since:2.2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Microwave</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Photons with a wavelength range: $1.00 \times 10^6$ to $1.50 \times 10^7$ nm</td>
<td>Since:1.0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MidLatitudeRegion</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>When considering the case of the Earth, the mid-latitude region typically refers to two latitudinal bands, one in the northern hemisphere and the other in the southern hemisphere extending from about 23 degrees to 50 degrees. The concept of mid-latitude regions does not apply to all bodies in the solar system and different latitudinal ranges would apply for each body case by case. The mid-latitude regions may be defined by using either planetographic or magnetic coordinates if the magnetic dipole is closely aligned with the spin axis of a magnetized body. Ground magnetometers located at mid latitude on the Earth are well positioned to measure magnetic storm-time ring current variations.</td>
<td>Since:2.3.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mimas</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The smallest and least massive of the round moons of Saturn.</td>
<td>Since:2.2.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MIMEType</strong></th>
<th><strong>Text</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multipurpose Internet Mail Extensions (MIME) type and sub-type which characterizes the format of a file. MIME media types are define in RFC memorandum RFC 2046. Current MIME types are maintained by Internet Assigned Numbers Authority (IANA) at <a href="http://www.iana.org/assignments/media-types/index.html">http://www.iana.org/assignments/media-types/index.html</a>. Commonly used MIME types are: application/vnd.ms-powerpoint (ppt, pptx), application/vnd.ms-excel (xls, xlsx), text/richtext (rtx), application/postscript (eps, ps), application/pdf (pdf), application/xml-dtd (dtd), text/html (htm, html), text/xml (xsl, xml, xsd), application/x-dvi (dvi). If a document is compressed the specified MIME type should be for the uncompressed document.</td>
<td>Since:2.2.2</td>
</tr>
</tbody>
</table>

Used by: Document

<table>
<thead>
<tr>
<th><strong>Minimum</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The smallest value of a batch or sample or the lower bound of a probability distribution.</td>
<td>Since:2.2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Miranda</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The smallest and innermost round moon of Uranus.</td>
<td></td>
</tr>
</tbody>
</table>
MirrorURL

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

Since: 1.3.1

Used by: Source

MissionManager

A Mission Manager is a rolename used by the ESA. The Mission Manager corresponds to the Project Manager role used by NASA but the Mission Manager role only begins after the launch of the mission.

Since: 2.3.2

MissionPrincipalInvestigator

An individual who is the administrative and scientific lead for a mission.

Since: 2.3.2

Mixed

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."

Since: 1.0.0

Sub-elements MixedQuantity
  
  ParticleType
  
  Qualifier

Used by: Parameter

MixedQuantity

A characterization of the combined attributes of a quantity.

Since: 1.3.5

Allowed Values
  
  AkasofuEpsilon
  
  AlfvenMachNumber
  
  AlfvenVelocity
  
  FrequencyToGyrofrequencyRatio
  
  IMFclockAngle
  
  MagnetosonicMachNumber
  
  Other
  
  PlasmaBeta
  
  SolarUVFlux
  
  TotalPressure
  
  VCrossB

Used by: Mixed

ModeAmplitude

Item
In helioseismology the magnitude of oscillation of waves of a particular geometry.
   Since:1.0.0

**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.
   Since:1.0.0

**Moment**
Parameters determined by integration over a distribution function convolved with a power of velocity.
   Since:1.0.0

**Moon**
The only natural satellite of the Earth.
   Since:2.2.3

**MPEG**
A digital format for movies defined by the Motion Picture Experts Group.
   Since:1.0.0

**MSO**
Mars/Mercury Solar Orbital A coordinate system related to Mars or Mercury. A coordinate system where, depending on the body (Mars or Mercury), X is anti-sunward, Y along the orbital velocity direction.
   Since:2.2.4

**MultispectralImager**
An instrument which captures images at multiple spectral ranges.
   Since:1.2.1

**NaD**
A spectrum with a wavelength range of centered at 589.3 nm. VSO nickname: Na-D image with a range of 588.8 nm to 589.8 nm.
   Since:1.2.1

**Name**
A language unit by which a person or thing is known.
   Since:1.0.0

   Used by: AccessURL
<table>
<thead>
<tr>
<th>Element</th>
<th>InformationURL</th>
<th>InputProperty</th>
<th>OutputProperty</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Since: 1.1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NearEarth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The heliospheric region near the Earth which extends to and includes the area near the L1 and L2 Lagrange point.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Since: 1.1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NearSurface</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowed Values</td>
<td>Atmosphere</td>
<td>AuroralRegion</td>
<td>EquatorialRegion</td>
<td>Ionosphere</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ionosphere.DRegion</td>
<td>Ionosphere.ERegion</td>
<td>Ionosphere.FRegion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ionosphere.Topside</td>
<td>Mesosphere</td>
<td>MidLatitudeRegion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plasmasphere</td>
<td>PolarCap</td>
<td>SouthAtlanticAnomalyRegion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thermosphere</td>
<td>SubAuroralRegion</td>
<td>Thermosphere</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Troposphere</td>
<td></td>
<td>Troposphere</td>
</tr>
<tr>
<td>Neptune</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The seventh planet from the sun in our solar system.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Since: 1.2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowed Values</td>
<td>Magnetosphere</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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>

Since: 1.0.0

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

Since: 1.2.1

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

Since: 1.0.0

NeutralGas
Measurements of neutral atomic and molecular components of a gas.

Since: 1.0.0

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

Since: 1.2.1

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.)

Since: 1.3.6

Ni6768
A spectrum with a wavelength range centered at 676.8 nm. VSO nickname: Ni-6768
None
A lack or absence of anything.
Since: 1.0.0

Note
Information which is useful or important for the understanding of a value or parameter.
Since: 1.2.0

NumberDensity
The number of particles per unit volume.
Since: 1.0.0

NumberFlux
The number of particles passing a unit area in unit time, possibly also per unit energy (or equivalent) and/or per unit look direction.
Since: 1.2.1

NumericalData
Data stored as numerical values in one or more specified formats. A Numerical Data resource is a type of "data product" which is a set of data that is uniformly processed and formatted, from one or more instruments, typically spanning the full duration of the observations of the relevant instrument(s). A data product may consist of Parameters stored in a collection of granules of successive time spans or a single data granule.
Since: 1.0.0

Sub-elements
ResourceId
ResourceHeader
AccessInformation
ProcessingLevel
ProviderName
ProviderResourceName
ProviderProcessingLevel
ProviderVersion
InstrumentID
Oberon

The second-largest and second most massive mon of Uranus, and the ninth most massive moon in the Solar System.

Since: 2.2.5

ObservationExtent

The spatial area encompassed by an observation.

Since: 1.3.6

Sub-elements

- ObservedRegion
- StartLocation
- StopLocation
- Note

Used by: Annotation

Observatory

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

Since: 1.0.0

Sub-elements

- ResourceID
- ResourceHeader
- ObservatoryGroupID
- Location
- OperatingSpan
- Extension

Used by: Spase

ObservatoryGroupID

The identifier of an Observatory resource which the referring resource is a member of.

Since: 2.2.0

Used by: Observatory

ObservatoryID

The identifier of an Observatory resource.

Since: 1.0.0
A spatial location distinguished by certain natural features or physical characteristics where an observatory is located.

Since: 1.2.0

Allowed Values

- Asteroid
- Comet
- Earth
- Earth.Magnetosheath
- Earth.Magnetosphere
- Earth.Magnetosphere.Magnetotail
- Earth.Magnetosphere.Main
- Earth.Magnetosphere.Plasmasphere
- Earth.Magnetosphere.Polar
- Earth.Magnetosphere.RadiationBelt
- Earth.Magnetosphere.RingCurrent
- Earth.Moon
- Earth.NearSurface
- Earth.NearSurface.Atmosphere
- Earth.NearSurface.AuroralRegion
- Earth.NearSurface.EquatorialRegion
- Earth.NearSurface.Ionosphere
- Earth.NearSurface.Ionosphere.DRegion
- Earth.NearSurface.Ionosphere.ERegion
- Earth.NearSurface.Ionosphere.FRegion
- Earth.NearSurface.Ionosphere.Topside
- Earth.NearSurface.Mesosphere
- Earth.NearSurface.MidLatitudeRegion
- Earth.NearSurface.Plasmasphere
- Earth.NearSurface.PolarCap
- Earth.NearSurface.SouthAtlanticAnomalyRegion
- Earth.NearSurface.Stratosphere
- Earth.NearSurface.SubAuroralRegion
- Earth.NearSurface.Thermosphere
- Earth.NearSurface.Troposphere
- Earth.Surface
- Heliosphere
- Heliosphere.Heliosheath
- Heliosphere.Inner
- Heliosphere.NearEarth
- Heliosphere.Outer
- Heliosphere.Remote1AU
- Interstellar
- Jupiter
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.Plasmasphere
- Earth.Magnetosphere.Polar
- Earth.Magnetosphere.RadiationBelt
- Earth.Magnetosphere.RingCurrent
- Earth.Moon
- Earth.NearSurface
- Earth.NearSurface.Atmosphere
- Earth.NearSurface.AuroralRegion
- Earth.NearSurface.EquatorialRegion
- Earth.NearSurface.Ionosphere
- Earth.NearSurface.Ionosphere.DRegion
- Earth.NearSurface.Ionosphere.ERegion
- Earth.NearSurface.Ionosphere.FRegion
- Earth.NearSurface.Ionosphere.Topside
- Earth.NearSurface.Mesosphere
- Earth.NearSurface.MidLatitudeRegion
- Earth.NearSurface.Plasmasphere
- Earth.NearSurface.PolarCap
- Earth.NearSurface.SouthAtlanticAnomalyRegion
- Earth.NearSurface.Stratosphere
- Earth.NearSurface.SubAuroralRegion
- Earth.NearSurface.Thermosphere
- Earth.NearSurface.Troposphere
- Earth.Surface
- Heliosphere
- Heliosphere.Heliosheath
- Heliosphere.Inner
- Heliosphere.NearEarth
- Heliosphere.Outer
- Heliosphere.Remote1AU
- Interstellar
- Jupiter
Saturn.Magnetosphere.Magnetotail
Saturn.Magnetosphere.Main
Saturn.Magnetosphere.Plasmasphere
Saturn.Magnetosphere.Polar
Saturn.Magnetosphere.RadiationBelt
Saturn.Magnetosphere.RingCurrent
Saturn.Mimas
Saturn.Rhea
Saturn.Tethys
Saturn.Titan
Sun
Sun.Chromosphere
Sun.Corona
Sun.Interior
Sun.Photosphere
Sun.TransitionRegion
Uranus
Uranus.Ariel
Uranus.Magnetosphere
Uranus.Magnetosphere.Magnetotail
Uranus.Magnetosphere.Main
Uranus.Magnetosphere.Plasmasphere
Uranus.Magnetosphere.Polar
Uranus.Magnetosphere.RadiationBelt
Uranus.Magnetosphere.RingCurrent
Uranus.Miranda
Uranus.Oberon
Uranus.Puck
Uranus.Titania
Uranus.Umbriel
Venus
Venus.Magnetosphere
Venus.Magnetosphere.Magnetotail
Venus.Magnetosphere.Main
Venus.Magnetosphere.Plasmasphere
Venus.Magnetosphere.Polar
Venus.Magnetosphere.RadiationBelt
Venus.Magnetosphere.RingCurrent

Used by: DisplayData
          NumericalData
          ObservationExtent

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.
Since: 1.0.0

Open
Access is granted to everyone.
Since: 1.0.0

OperatingSpan
The interval in time from the first point at which an instrument or spacecraft was producing and sending data until the last such time, ignoring possible gaps.
Since: 2.2.0
Sub-elements: StartDate, StopDate, Note
Used by: Instrument, Observatory

OperatingSystem
The software that supports a computer’s basic functions, such as scheduling tasks, executing applications, and controlling peripherals.
Since: 2.4.0
Used by: ExecutionEnvironment

Optical
Photons with a wavelength range: 380 to 760 nm
Since: 1.0.0

ORCIdentifier
A Open Researcher Contributor (ORC) identifier which is a unique alphanumeric string assigned by a registration agency (https://orcid.org/) to identify an individual. It has the format xxxx-xxxx-xxxx-xxxx
Since: 2.3.0
Used by: Person

OrganizationName
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.
Since: 1.0.0
Used by: Person

Orientation

The specification of the directional alignment of an object or measurement in a reference coordinate system. The orientation such as a spacecraft spin axis attitude is usually expressed as one or more angles relative to the basis axes of some specified physical space usually together with the date/time of the observation.

Since:2.3.1

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

Since:1.0.0

Outer
The region of the heliosphere extending radially outward from just outside 1 AU to the heliospheric termination shock.

Since:1.0.0

OutputProperty
A container of attributes regarding an output property of an application.

Since:2.4.0

Sub-elements
Name
Description
Caveats
Units
ValidMin
ValidMax

Used by: Software

Overview
A web page that provides an overview of available data and links.

Since:2.3.0

Parallel
Having the same direction as a given direction

Since:1.0.0

Parameter
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.

Since:1.0.0

Sub-elements
Name
Set
ParameterKey
ParameterKey

The name or identifier which can be used to access the parameter in the resource. The associated value is dependent on the service used to access the resource. For columnar ASCII data, use "Column_X" for a single-element parameter and "Column_X-Column_Y" for a multi-element parameter, where X and Y are the relevant column index. The first column index is 1.

Since: 1.1.0

Used by: Catalog, DisplayData, NumericalData

ParentID

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.

Since: 1.1.0

Used by: Granule

PartiallyRestricted

Some portions of the resource have restricted access, the rest is open access. Typically this is for accumulating data collections where some data is under review before being publicly released.

Since: 2.2.9
A description of the types of particles observed in the measurement. This includes both direct observations and inferred observations.

Since: 1.0.0

Sub-elements **ParticleType**
- **Qualifier**
- **ParticleQuantity**
- **AtomicNumber**
- **EnergyRange**
- **AzimuthalAngleRange**
- **PolarAngleRange**
- **MassRange**
- **PitchAngleRange**

Used by: **Parameter**

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

Since: 1.0.0

**ParticleDetector**
An instrument which detects particle flux!!!

Since: 1.0.0

**ParticleQuantity**
A characterization of the physical properties of the particle.

Since: 1.1.0

Allowed Values **AdiabaticInvariant**
- **AdiabaticInvariant.MagneticMoment**
- **AdiabaticInvariant.BounceMotion**
- **AdiabaticInvariant.DriftMotion**
- **ArrivalDirection**
- **AtomicNumberDetected**
- **AverageChargeState**
- **ChargeFlux**
- **ChargeState**
- **CountRate**
- **Counts**
- **DynamicPressure**
- **Energy**
- **Entropy**
- **EnergyDensity**
- **EnergyFlux**
- **EnergyPerCharge**
FlowSpeed
FlowVelocity
Fluence
GeometricFactor
Gyrofrequency
HeatFlux
LShell
Mass
MassDensity
MassNumber
MassPerCharge
NumberDensity
NumberFlux
ParticleRadius
ParticleRigidity
PhaseSpaceDensity
PlasmaFrequency
Pressure
SonicMachNumber
SoundSpeed
Temperature
ThermalSpeed
Velocity

Used by: Particle

ParticleRadius
The mean radius for a Gaussian distribution of particles with an axial ratio of 2 and a distribution width that varies as 0.5 radius. A value of zero means no cloud was detected.
Since: 2.2.2

ParticleRigidity
The particle momentum per unit charge. The particle Rigidity, R, is equal to pc/Ze.
Since: 2.3.2

ParticleType
A characterization of the kind of particle observed by the measurement.
Since: 1.0.0
Allowed Values: Aerosol, AlphaParticle, Atom, Dust, Electron, Ion, Molecule
Neutron
Proton
Positron

Used by: Mixed
Particle

PartOf
A portion of a larger resource.
Since: 1.3.3

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.
Since: 1.3.4

PDF
A document expressed in the Portable Document Format (PDF) as defined by Adobe.
Since: 1.0.0

PDS3
The Planetary Data System, version 3 (PDS3) standard provides guidelines on how a data producer should construct a data set suitable for long-term archiving. The standard contains a number of requirements in terms of dataset structure and documentation that should allow for any PDS compliant data set to be used and understood in the long term. Each PDS3 data product must be labelled in ASCII with full details on the structure and content of the product. The label can be attached to the data file itself or detached in a separate 'label' file with the suffix LBL. The PDS3 standard is described at: https://pds.jpl.nasa.gov/datastandards/pds3/standards/ Since 2011, PDS3 has superseded by the PDS4 archiving standard. However, many data files still exist that are stored by using the PDS3 standard.
Since: 2.3.2

PDS4
The Planetary Data System, version 4 (PDS4) standard provides guidelines on how a data producer should construct a data set suitable for long-term archiving. The standard contains a number of requirements in terms of dataset structure and documentation that should allow for any PDS compliant data set to be used and understood in the long term. Each PDS4 bundle consists of two files, one containing the data and the other an eXtensible Markup Language (XML) file containing the label. PDS4 recognises four base data structures, array, table, parsable byte stream and encoded byte stream with arrays and tables most commonly in use. The PDS4 standard is described at: https://pds.jpl.nasa.gov/datastandards/documents/current-version.shtml. The PDS4 archiving standard has been required for data archives from NASA-funded planetary missions and for small data archives since 2011.
Since: 2.3.2
**Peak**
The maximum value for the quantity in question, over a period of time which is usually equal to the cadence.

Since: 1.0.0

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

Since: 1.2.0

Used by: DataExtent

**Perpendicular**
At right angles to a given direction.

Since: 1.0.0

**Person**
An individual human being.

Since: 1.0.0

Sub-elements: **ResourceId**, ReleaseDate, PersonName, OrganizationName, Address, Email, PhoneNumber, FaxNumber, ORCIDIdentifier, Note, Extension

Used by: Spase

**PersonID**
The identifier assigned to a Person description.

Since: 1.0.0

Used by: Contact

**PersonName**
The words used to address an individual.

Since: 1.0.0

Used by: Person

**Perturbation**
Variations in the state of a system.
Since: 1.3.6

<table>
<thead>
<tr>
<th>Phase</th>
<th>Item</th>
<th>Since: 1.3.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>A point or portion in a recurring series of changes.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.3.6

<table>
<thead>
<tr>
<th>PhaseAngle</th>
<th>Item</th>
<th>Since: 1.2.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase difference between two or more waves, normally expressed in degrees.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.3.6

<table>
<thead>
<tr>
<th>PhaseSpaceDensity</th>
<th>Item</th>
<th>Since: 1.0.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of particles per unit volume in the six-dimensional space of position and velocity.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.3.6

<table>
<thead>
<tr>
<th>PhenomenonType</th>
<th>Enumeration</th>
<th>Since: 1.0.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>The characteristics or categorization of an event type.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.0.0

Allowed Values

- **ActiveRegion**
- **Aurora**
- **BowShockCrossing**
- **CoronalHole**
- **CoronalMassEjection**
- **EITWave**
- **EnergeticSolarParticleEvent**
- **ForbushDecrease**
- **GeomagneticStorm**
- **InterplanetaryShock**
- **MagneticCloud**
- **MagnetopauseCrossing**
- **RadioBurst**
- **SectorBoundaryCrossing**
- **SolarFlare**
- **SolarWindExtreme**
- **StreamInteractionRegion**
- **Substorm**

Used by:

- **Annotation**
- **Catalog**

Since: 1.3.6

<table>
<thead>
<tr>
<th>Phobos</th>
<th>Item</th>
<th>Since: 2.2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>The larger and inner most moon of Mars.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since: 2.2.5
**PhoneNumber**
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.

Since: 1.0.0

Used by: **Person**

**Photograph**
An image (positive or negative) registered on a piece of photo-sensitive paper

Since: 2.2.0

**PhotographicPlate**
A rigid (typically glass) medium that functions like film. Its rigidity is for guarding against image distortion due to medium deformation (caused by heat and humidity). Photographic plates are often used for astronomical photography.

Since: 2.2.0

**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.

Since: 1.2.1

**PhotomultiplierTube**
A vacuum phototube that is an extremely sensitive detector of light in the ultraviolet, visible, and near-infrared ranges of the electromagnetic spectrum.

Since: 2.2.3

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

Since: 1.0.0

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

Since: 1.2.1

**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.

Since: 1.0.0

**PitchAngleRange**
The range of possible pitch angles for a group of particle observations.
Sub-elements **Low**

**High**

**Units**

**Bin**

Used by: **Particle**

---

**PlasmaBeta**

The ratio of the plasma pressure ($nkT$) to the magnetic pressure ($B^2/2\mu_0$) of the SUM($nkT$)/($B^2/2\mu_0$).

Since: 1.3.5

---

**PlasmaFrequency**

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

Since: 1.2.1

---

**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.

Since: 1.3.5

---

**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.

Since: 1.2.0

---

**PlasmaWaves**

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

Since: 1.3.5

---

**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.

Since: 1.3.1

---

**Pluto**

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

Since: 1.2.0
PNG

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

Since: 1.0.0

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.

Since: 1.1.0

PolarAngle

The angle between the position or measured vector and the k-axis of the coordinate system. Mathematically defined as \(\arctan(\sqrt{i^2+j^2})/k\). This term could be also applied to angles between the vector and other components, for example the IMF cone angle defined as \(\arccos(B_x/B_t)\).

Since: 1.3.4

PolarAngleRange

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

Since: 1.1.0

Sub-elements

- Low
- High
- Units
- Bin

Used by: Particle

PolarCap

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.

Since: 1.2.0

Policy

A deliberate system of principles to guide decisions and achieve rational outcomes. A policy is a statement of intent, and is implemented as a procedure or protocol.

Since: 2.4.0

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.

Since: 1.0.0
**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.

Since: 1.0.0

**Positron**

An elementary particle consisting of a charge of positive electricity equal to about $1.602 \times 10^{-19}$ Coulomb and having a mass when at rest of about $9.109534 \times 10^{-28}$ gram.

Since: 2.3.1

**Poster**

A set of information arranged on a single page or sheet, typically in a large format.

Since: 2.2.2

**Postscript**

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

Since: 1.2.0

**Potential**

The work required per unit charge to move a charge from a reference point to a point at infinity (electric potential is defined to be zero). The electric potential of a spacecraft is often referred to as the "spacecraft potential". The spacecraft potential is the electric potential of the spacecraft relative to the potential of the nearby plasma. The spacecraft potential is non-zero because the spacecraft charges to the level that the emitted photoelectron flux going to infinity is balanced by the plasma electron flux to the spacecraft.

Since: 1.0.0

**PowerSpectralDensity**

The Power Spectral Density, PSD, is the measure of signal power content versus frequency, energy, wave number, etc. A PSD is typically used to characterize broadband random signals. The amplitude of the PSD is normalized by the spectral resolution employed to digitize the signal.

Since: 2.3.2

**PoyntingFlux**

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

Since: 1.0.0

**Presentation**

A set of information that is used when communicating to an audience.
Pressure
The force per unit area exerted by a particle distribution or field.
Since:1.1.0

PrincipalInvestigator
An individual who is the administrative and scientific lead for an investigation.
Since:1.0.0

Print
A sheet of any written or printed material which may include notes or graphics. Multiple printed pages may be bound into a manuscript or book.
Since:2.2.0

Prerequisites
A thing that is required to be installed on your computer in order to run or compile the software.
Since:2.4.0
Used by: Software

ExecutionEnvironment
An execution platform for software which includes an operating system and necessary hardware.
Since:2.4.0
Sub-elements OperatingSystem
Installer
Cores
Storage
Memory
Used by: Software

PriorID
The resource identifier for a resource that is superseded or replaced by a resource.
Since:1.2.0
Used by: Granule
ResourceHeader

Probable
Likely given the available evidence. Considered in the range of 4-7 on a scale of 0-10.
Since:1.3.4

ProcessingLevel

The standard classification of the processing performed on the product.
Since: 1.2.0

Allowed Values: Calibrated, Raw, Uncalibrated, ValueAdded

Used by: DisplayData, NumericalData

ProductKey
A string of characters used to uniquely identify a particular product within a Repository. The style or format of the identifier is determined by the Repository. The kinds of resources which can be accessed include, but are not limited to, numerical data, display data, documents and event lists. The method to access the product is determined by the attributes of an access service.
Since: 2.2.2

Used by: AccessURL

Profile
Measurements of a quantity as a function of height above an object such as the limb of a body.
Since: 1.0.0

ProgramManager
An individual whose major task entails direction of program team members such that the full organization achieves the objectives and goals of a program. The Program Manager is expected to provide clear guidance and resolve conflicts and issues while maintaining focus on achieving program success.
Since: 2.3.2

ProgramScientist
A program scientist is someone who performs a range of scientific program planning duties, takes responsibility for the science content of flight mission programs or projects. A program scientist develops, reviews, and provides recommendations for proposed program requirements, expected results, budgetary estimates and also establishes methods and procedures to reduce program costs, provides expert advice to management on strategic planning and program development, develops and manages research program, and presents issues and proposes solutions to senior management.
Since: 2.3.2

Project
The name of an organized activity with a stated goal or objective.
Since: 2.3.0

Used by: Funding

ProjectEngineer

An engineer tasked with the full suite of responsibilities as a project transitions through requirements derivation and preliminary design into controlled hardware development, assembly and environmental testing. The Project Engineer manages a team while developing the cadence of hardware manufacturing and assembly until instrument deployment and through the end of the mission.

Since:2.3.1

Projection

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

Since:1.3.4

Allowed Values

\[IJ\] 
\[IK\] 
\[JK\]

ProjectManager

An individual whose major task entails direction of project team members such that the full organization achieves the objectives and goals of the mission. The Project Manager is expected to provide clear guidance and resolve conflicts and issues while maintaining focus on achieving mission success.

Since:2.3.1

ProjectScientist

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

Since:1.1.0

PropagationTime

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

Since:1.3.5

Property

A container of attributes regarding the property of an application.

Since:2.4.0

ProportionalCounter

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

Since:1.2.1

Proteus

The second largest moon of Neptune.
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.

Since:1.0.0

ProviderName
The source, or original provider, of the data (for example, PDS PPI).

Since:2.2.9
Used by: Catalog
          DisplayData
          NumericalData

ProviderProcessingLevel
The provider specific information on the processing performed on the product. This should include the provider processing level designation and information about the intended use of the product. For example, if it is to be used for machine learning or other high level applications.

Since:1.0.0
Used by: DisplayData
          NumericalData

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

Since:1.0.0
Used by: Catalog
          DisplayData
          NumericalData

ProviderVersion
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.

Since:1.0.0
Used by: Catalog
          DisplayData
          NumericalData

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

Since:1.3.4

PublicationDate

Since:2.2.5
The date that the work (document, data, images or other resource) was first published.
Since:2.3.0
Used by: PublicationInfo

PublicationInfo
The information required to mint a DOI for the resource being described in SPASE.
Since:2.3.0
Sub-elements Authors
PublicationDate
PublishedBy

Used by: ResourceHeader

PublishedBy
The name or the company, organization or individual that published the work.
Since:2.3.0
Used by: PublicationInfo

Publisher
An individual, organization, institution or government department responsible for the production and dissemination of a document.
Since:1.3.0

Puck
The largest inner spherical moon of Uranus.
Since:2.2.5

QuadrisphericalAnalyser
An instrument used for the 3-D detection of plasma, energetic electrons and ions, and for positive-ion composition measurements.
Since:1.0.0

Qualifier
Characterizes the refinement to apply to a type or attribute of a quantity.
Since:1.3.1
Allowed Values Anisotropy
Array
AutoSpectrum
Average
Characteristic
Circular
Coherence
Column
Component
Component.I

145
Component.J
Component.K
Confidence
Core
CrossSpectrum
Deviation
Differential
Direction
Directional
DirectionAngle
DirectionAngle.AzimuthAngle
DirectionAngle.ElevationAngle
DirectionAngle.PolarAngle
DirectionCosine
DirectionCosine.I
DirectionCosine.J
DirectionCosine.K
EncodedParameter
FieldAligned
Fit
Group
Halo
ImaginaryPart
Integral
Integral.Area
Integral.Bandwidth
Integral.SolidAngle
Linear
LineOfSight
Magnitude
Maximum
Median
Minimum
Moment
Parallel
Peak
Perpendicular
Perturbation
Phase
PhaseAngle
PowerSpectralDensity
Projection
Projection.IJ
Projection.IK
A value that describes a characteristic of a system.

Since: 1.3.0

Used by: DataExtent

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

Since: 1.0.0

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

Since: 1.0.0

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.

Since: 1.0.0
<table>
<thead>
<tr>
<th><strong>Item</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RadiationBelt</strong></td>
<td>The region within a magnetosphere where high-energy particles could potentially be trapped in a magnetic field. Since: 1.1.0</td>
</tr>
<tr>
<td><strong>RadioBurst</strong></td>
<td>Emissions of the sun in radio wavelengths from centimeters to dekameters, under both quiet and disturbed conditions. Radio Bursts can be &quot;Type I&quot; consisting of many short, narrow-band bursts in the metric range (300 - 50 MHz); &quot;Type II&quot; consisting of narrow-band emission that begins in the meter range (300 MHz) and sweeps slowly (tens of minutes) toward dekameter wavelengths (10 MHz); &quot;Type III&quot; consisting of narrow-band bursts that sweep rapidly (seconds) from decimeter to dekameter wavelengths (500 - 0.5 MHz); and &quot;Type IV&quot; consisting of a smooth continuum of broad-band bursts primarily in the meter range (300 - 30 MHz). Since: 1.3.0</td>
</tr>
<tr>
<td><strong>RadioFrequency</strong></td>
<td>Photons with a wavelength range: 100,000 to 1.00x10^11 nm. Since: 1.0.0</td>
</tr>
<tr>
<td><strong>Radiometer</strong></td>
<td>An instrument for detecting or measuring radiant energy. Radiometers are commonly limited to infrared radiation. Since: 1.2.1</td>
</tr>
<tr>
<td><strong>Ratio</strong></td>
<td>The relative magnitudes of two quantities. Since: 1.1.0</td>
</tr>
<tr>
<td><strong>Raw</strong></td>
<td>Data in its original state with no processing to account for calibration. Similar to NASA Level 0. Since: 1.0.0</td>
</tr>
<tr>
<td><strong>RealPart</strong></td>
<td>Any number z can in general be represented by its complex form with z = a + ib where i, which is defined as the square root of -1, signifies the imaginary component of the number z. The coefficient a is called the real part of the complex number z. Since: 2.3.2</td>
</tr>
<tr>
<td><strong>Registry</strong></td>
<td>A location or facility where resources are cataloged.</td>
</tr>
</tbody>
</table>

Since: 1.1.0
Since:1.1.0
Sub-elements ResourceID
ResourceHeader
AccessURL
Extension

Used by: Spase

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

Since:1.1.0

Used by: TimeSpan

ReleaseDate 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.

Since:1.1.0

Used by: Granule
Person
ResourceHeader
RevisionEvent

Remark Item
A notice, comment, or observation.

Since:2.4.1

Remote1AU Item
A roughly toroidal region that includes the Earth's orbit, but exclusive of the region near the Earth.

Since:1.1.0

RenderingAxis Enumeration
A reference component of a plot or rendering of data. A plot typically is a 2-dimensional rendering with a horizontal and vertical axis. A third dimension can be introduced with a color coding of the rendered data.

Since:2.2.0

Allowed Values ColorBar
Horizontal
Vertical

Used by: RenderingHints

RenderingHints Container
Attributes to aid in the rendering of parameter.
Since: 1.3.1

**Sub-elements**
- **DisplayType**
- **AxisLabel**
- **RenderingAxis**
- **Index**
- **ValueFormat**
- **ScaleMin**
- **ScaleMax**
- **ScaleType**

**Used by:** Element, Parameter

---

**Report**

A document which describes the findings of some individual or group.

Since: 2.2.2

---

**Repository**

A location or facility where resources are stored.

Since: 1.1.0

**Sub-elements**
- **RepositoryID**
- **ResourceHeader**
- **AccessURL**
- **Extension**

**Used by:** Space

---

**RepositoryID**

The identifier of an Repository resource.

Since: 1.0.0

**Used by:** AccessInformation

---

**ResonanceSounder**

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

Since: 1.0.0

---

**ResourceHeader**

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

Since: 1.0.0

**Sub-elements**
- **ResourceName**
- **AlternateName**
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.

Since: 1.0.0

Used by: Annotation, Catalog, DisplayData, Document, Instrument, NumericalData, Observatory, Registry, Repository, Service, Software
A short textual description of a resource which may be useful when read by a person.
   Since:1.0.0
   Used by: ResourceHeader

Restricted
Access to the product is regulated and requires some form of identification.
   Since:1.0.0

RetardingPotentialAnalyser
An instrument which measures ion temperatures and ion concentrations using a planar ion trap.
   Since:1.2.1

RevisionEvent
A specific change that improves or upgrades.
   Since:2.3.1
   Sub-elements ReleaseDate
   Note
   Used by: RevisionHistory

RevisionHistory
A history of changes that improve or upgrade.
   Since:2.3.1
   Sub-elements RevisionEvent
   Used by: ResourceHeader

RevisionOf
A modified version of a resource instance.
   Since:1.3.3

Rhea
The second-largest moon of Saturn and the ninth-largest moon in the Solar System.
   Since:2.2.5

RingCurrent
One of the major current systems confined within planetary magnetospheres. The ring current circles in the magnetic equatorial plane of magnetospheres. It is generated by the longitudinal drift of energetic charged particles trapped on inner, dipole-like magnetospheric field lines. At the Earth, the ring current is carried by 10 to 200 keV charged particles typically located at L-shells between 3 and 6. The ring current is also the primary driver of the Sym H and Dst Indices of magnetic storm activity at the Earth.
   Since:2.3.1
RINEX2
Receiver Independent Exchange Format (RINEX) - version 2.*, is a data interchange format for raw satellite navigation system data. https://files.igs.org/pub/data/format/rinex211.txt
Since:2.4.1

RINEX3
Receiver Independent Exchange Format (RINEX) - version 3.*, is a data interchange format for raw satellite navigation system data. https://files.igs.org/pub/data/format/rinex300.pdf
Since:2.4.1

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.
Since:1.2.1

Role
The assigned or assumed function or position of an individual.
Since:1.0.0

Allowed Values
Author
ArchiveSpecialist
CoInvestigator
CoPI
Contributor
DataProducer
DeputyPI
Developer
FormerPI
GeneralContact
HostContact
InstrumentLead
InstrumentScientist
MetadataContact
MissionManager
MissionPrincipalInvestigator
PrincipallInvestigator
ProgramManager
ProgramScientist
ProjectEngineer
ProjectManager
ProjectScientist
Publisher
Scientist
**RORIdentifier**
The assigned Research Organization Registry (ROR) identifier. See https://ror.org/
Since:2.3.3

**RotationMatrix**
A tensor that is used to perform vector data transformation from one coordinate system to another.
Since:2.3.2

**RTN**
Radial Tangential Normal. Typically centered at a spacecraft. Used for IMF and plasma V vectors. The X axis (radial) is set as the primary axis, and is defined as the axis pointing from the spacecraft to the Sun. The Z axis (tangential) is set as the secondary axis, and is defined as that portion of the solar North rotational axis which is perpendicular to the primary axis. The Y axis (normal) is defined as Z cross X.
Since:1.0.0

**S3_BUCKET**
A container of objects that comply with the Amazon Simple Storage Service (S3) specifications. A bucket has a unique, user-assigned key (name). A bucket can contain any number of objects with an aggregate size of 5 gigabytes. A bucket may be accompanied by up to 2 kilobytes of metadata.
Since:2.2.0

**Saturn**
The sixth planet from the sun in our solar system.
Since:1.2.0

Allowed Values
- Dione
- Enceladus
- Iapetus
- Magnetosphere
- Magnetosphere.Magnetotail
- Magnetosphere.Main
- Magnetosphere.Plasmasphere
- Magnetosphere.Polar
- Magnetosphere.RadiationBelt
- Magnetosphere.RingCurrent
- Mimas
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.
    Since: 1.0.0

Scalar
A quantity that is completely specified by its magnitude and has no direction.
    Since: 1.2.0

ScaleMax
The maximum value that the variable is expected to attain. Used, for example, by automated plotting software.
    Since: 1.3.1
    Used by: RenderingHints

ScaleMin
The minimum value that the variable is expected to attain. Used, for example, by automated plotting software.
    Since: 1.3.1
    Used by: RenderingHints

ScaleType
The scaling to apply to an axis. If this attribute is not present, linear scale should be assumed.
    Since: 1.3.1
    Allowed Values
    - LinearScale
    - LogScale
    Used by: RenderingHints

Scientist
An individual who is an expert in the phenomenon and related physics represented by the resource.
    Since: 1.0.0

ScintillationDetector
An instrument which detects flouresences of a material which is excited by high energy (ionizing) electromagnetic or charged particle radiation.
    Since: 1.2.1
<table>
<thead>
<tr>
<th>SE</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Ecliptic - A heliocentric coordinate system where the Z axis is normal to the ecliptic plane, positive northward. X axis is positive towards the first point of Aries (from Earth to Sun at vernal equinox). Same as HAE above. See <a href="http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html">http://nssdc.gsfc.nasa.gov/space/helios/coor_des.html</a></td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Search</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A web search interface that requires additional input.</td>
<td></td>
</tr>
<tr>
<td>Since: 2.3.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SearchCoil</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.0.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SectorBoundaryCrossing</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A sector boundary crossing is a transit by a spacecraft across the heliospheric current sheet separating the dominantly outward (away-from-the-sun) interplanetary magnetic field of one hemisphere of the heliosphere from the dominantly inward (toward-the-sun) polarity of the other hemisphere. Such crossings have multi-day intervals of opposite IMF dominant polarities on either side.</td>
<td></td>
</tr>
<tr>
<td>Since: 2.2.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service</th>
<th>Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>A location or facility that can perform a well defined task.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.1.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sub-elements</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>ResourceID</td>
<td></td>
</tr>
<tr>
<td>ResourceHeader</td>
<td></td>
</tr>
<tr>
<td>AccessURL</td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td></td>
</tr>
</tbody>
</table>

| Used by: | Spase |

<table>
<thead>
<tr>
<th>Set</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>A collection of items for a particular purpose.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.3.0</td>
<td></td>
</tr>
</tbody>
</table>

| Used by: | Parameter |

<table>
<thead>
<tr>
<th>SHA1</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Since: 1.2.0</td>
<td></td>
</tr>
</tbody>
</table>

| 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.

Since:1.2.0

<table>
<thead>
<tr>
<th>Size</th>
<th>Sequence</th>
</tr>
</thead>
</table>
| 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 $3^n$.
| Since:1.0.0
| Used by: Structure

<table>
<thead>
<tr>
<th>SM</th>
<th>Item</th>
</tr>
</thead>
</table>
| 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.
| Since:1.0.0

<table>
<thead>
<tr>
<th>Software</th>
<th>Container</th>
</tr>
</thead>
</table>
| An application which can be installed, built or readily used.
| Since:2.4.0
| Sub-elements |
| ResourceID
| ResourceHeader
| SoftwareVersion
| ApplicationInterface
| CodeLanguage
| Prerequisites
| ExecutionEnvironment
| InputProperty
| OutputProperty
| Used by: Spase

<table>
<thead>
<tr>
<th>SoftwareVersion</th>
<th>Text</th>
</tr>
</thead>
</table>
| Describes the edition of the software release. The formation rule for the version may vary between software packages. It is intended to aid in queries to the software provider regarding the software.
| Since:1.0.0
| Used by: Software

<table>
<thead>
<tr>
<th>SoftXRays</th>
<th>Item</th>
</tr>
</thead>
</table>
| X-Rays with an energy range of 0.12 keV to 12 keV.
| Since:1.3.5
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Since</th>
</tr>
</thead>
<tbody>
<tr>
<td>SolarFlare</td>
<td>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.</td>
<td>1.0.0</td>
</tr>
<tr>
<td>SolarUVFlux</td>
<td>The amount of Ultraviolet energy originating from the Sun passing through a unit area in a unit time.</td>
<td>2.2.4</td>
</tr>
<tr>
<td>SolarWindExtreme</td>
<td>Intervals of unusually large or small values of solar wind attributes such as flow speed and ion density.</td>
<td>1.0.0</td>
</tr>
<tr>
<td>SolidAngle</td>
<td>Integration over the angle in three-dimensional space that an object subtends at a point.</td>
<td>1.3.6</td>
</tr>
<tr>
<td>SolidStateDetector</td>
<td>A detector of the charge carriers (electrons and holes) generated in semiconductors by energy deposited by gamma ray photons. Also known as a &quot;semiconductor detector&quot;.</td>
<td>2.2.3</td>
</tr>
<tr>
<td>SonicMachNumber</td>
<td>The ratio of the bulk flow speed to the speed of sound in the medium.</td>
<td>1.0.0</td>
</tr>
<tr>
<td>Sounder</td>
<td>An instrument which measures the radiances from an object. A sounder may measure radiances at multiple spectral ranges.</td>
<td>1.2.1</td>
</tr>
<tr>
<td>SoundSpeed</td>
<td>The speed at which sound travels through a medium.</td>
<td>2.0.1</td>
</tr>
<tr>
<td>Source</td>
<td>The location and attributes of an object.</td>
<td></td>
</tr>
</tbody>
</table>
Since: 1.3.1

Sub-elements **SourceType**
- URL
- MirrorURL
- Checksum
- DataExtent

Used by: **Granule**

<table>
<thead>
<tr>
<th><strong>Source Type</strong></th>
<th><strong>Enumeration</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A characterization of the function or purpose of the source.</td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.3.1

Allowed Values **Ancillary**
- Browse
- Data
- Layout
- Thumbnail

Used by: **Source**

<table>
<thead>
<tr>
<th><strong>South Atlantic Anomaly Region</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.2.0

<table>
<thead>
<tr>
<th><strong>Spacecraft Orbit Plane</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.2.1

<table>
<thead>
<tr>
<th><strong>Spacecraft Potential Control</strong></th>
<th><strong>Item</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>An instrument to control the electric potential of a spacecraft with respect to the ambient plasma by emitting a variable current of positive ions.</td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.0.0

<table>
<thead>
<tr>
<th><strong>SPASE</strong></th>
<th><strong>Container</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Physics Archive Search and Extract (SPASE). The outermost container or envelope for SPASE metadata. This indicates the start of the SPASE metadata.</td>
<td></td>
</tr>
</tbody>
</table>

Since: 1.0.0

Sub-elements **Version**
- Catalog
- DisplayData
- NumericalData
### Specification Item

A detailed description of the requirements and other aspects of an object or component that may be used to develop an implementation.

Since: 2.2.2

### Spectral Item

Characterized as a range or continuum of frequencies.

Since: 1.3.6

### SpectralPowerReceiver Item

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

Since: 1.0.0

### SpectralRange Enumeration

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

Since: 1.1.0

#### Allowed Values

- CaK
- ExtremeUltraviolet
- FarUltraviolet
- GammaRays
- Halpha
- HardXrays
- He10830
- He304
- Infrared
- K7699
- LBHBand
- Microwave
- NaD
- Ni6768
Optical
RadioFrequency
SoftX Rays
Ultraviolet
WhiteLight
XRays

Used by: DisplayData
FrequencyRange
NumericalData
WavelengthRange

Spectrogram
The characterization of signal strengths as a function of frequency (or energy) and time.
Since: 1.3.5

Spectrometer
An instrument that measures the component wavelengths of light (or other electromagnetic radiation) by splitting the light up into its component wavelengths.
Since: 1.0.0

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.
Since: 1.0.0

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, \(\arctan \left(\sqrt{i^2+j^2}\right)/k\), or an elevation angle, \(\arctan \left(k/\sqrt{i^2+j^2}\right)\).
Since: 1.0.0

SPICE
SPICE is an ancillary information system that provides scientists and engineers the capability to include space geometry and event data into mission design, science observation planning, and science data analysis software. The staff of the NASA Navigation and Ancillary Information Facility, NAIF, which is located at JPL provides SPICE support for planetary, heliophysics, and Earth science missions, see https://naif.jpl.nasa.gov/naif/index.html. This SPICE has been adapted from text on NAF hosted web pages.
Since: 2.3.2

SpinPeriod
The time required for an object such as a spacecraft or planet to perform one full rotation in a given frame of reference.
SpinPhase
An angular based or normalized parameter that specifies the spin state of an object such as a spacecraft or planet in a specific coordinate system usually together with the date/time of the observation.
Since:2.3.1

SpinRate
The angular rate of change of the spin angle of an object such as a spacecraft or planet.
Since:2.3.1

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>
Since:1.0.0

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>
Since:1.0.0

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.
Since:1.0.0

SSE_L
Selenocentric Solar Ecliptic. The X axis points from the center of the Earth's moon to the sun, the Z axis is normal to the ecliptic plane, positive northward. And the Y axis completes the right-handed set of axes.
Since:2.2.0

StackPlot
A representation of data showing multiple sets of observations on a single plot, possibly offsetting each plot by some uniform amount.
Since:1.3.1

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

Since: 1.2.0

### StartDate

**DateTime**

The specification of a starting point in time.

Since: 1.0.0

Used by: **Contact**
- **Granule**
- **OperatingSpan**
- **TimeSpan**

### StartLocation

**Text**

The initial position in space.

Since: 1.3.6

Used by: **ObservationExtent**

### StokesParameters

**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.

Since: 1.0.0

### StopDate

**DateTime**

The specification of a stopping point in time.

Since: 1.0.0

Used by: **Contact**
- **Granule**
- **OperatingSpan**
- **TimeSpan**

### StopLocation

**Text**

The final position in space.

Since: 1.3.6

Used by: **ObservationExtent**

### Storage

**Text**

The component of your computer that allows you to store and access data on a long-term basis. Indicate units with standard byte scales such as KB, MB, GB, TB and PB.

Since: 2.4.0

Used by: **ExecutionEnvironment**

### Strahl

**Item**

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

Since: 2.2.1
**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.

Since:1.2.0

**StreamInteractionRegion**

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

Since:2.0.2

**Strong**

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

Since:1.3.4

**Structure**

The organization and relationship of individual values within a quantity.

Since:1.2.0

Sub-elements **Size**

Description

Element

Used by: **Parameter**

**Style**

The manner in which a response from a URL is presented.

Since:2.3.0

Allowed Values **EPNTAP**

File

Git

HAPI

Listing

Search

TAP

Template

Overview

WebService

Used by: **AccessURL**

**SubAuroralRegion**

When considering the case of the Earth, the sub-auroral region typically refers to two latitudinal bands, one in the northern hemisphere and the other in the southern hemisphere extending from about 50 degrees to low 60 degrees. The concept sub-auroral regions does not apply to all bodies in the solar system and different latitudinal ranges would apply for
each body case by case. The sub-auroral regions may be defined by using either planetographic or magnetic coordinates if the magnetic dipole is closely aligned with the spin axis of a magnetized body. Ground magnetometers located at sub-auroral latitudes on the Earth measure a mixture of activity driven by auroral zone currents and the ring current.

Since:2.3.1

**Substorm**

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

Since:1.2.0

**Sun**

The star upon which our solar system is centered.

Since:1.0.0

Allowed Values

- Chromosphere
- Corona
- Interior
- Photosphere
- TransitionRegion

**Superhalo**

The part of an object or distribution surrounding some central body or distribution evident in a second break in the distribution function (e.g., a different power law). It consists of a population at a higher energies than for a halo.

Since:2.2.1

**Support**

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

Since:1.0.0

Sub-elements

- Qualifier
- SupportQuantity

Used by: Parameter

**SupportQuantity**

A characterization of the support information.

Since:1.0.0

Allowed Values

- DataQuality
- Housekeeping
- InstrumentMode
- Orientation
- Other
- Positional
- Remark
RotationMatrix
SpinPeriod
SpinPhase
SpinRate
Telemetry
Temporal
Velocity
WebResource
WebService

Used by: Support

Surface
The outermost area of a solid object.
Since: 1.0.0

Symmetric
Equal distribution about one or more axes.
Since: 1.3.1

TAP
The table access protocol (TAP) defines a service protocol for accessing general table data, including astronomical catalogs as well as general database tables. Access is provided for both database and table metadata as well as for actual table data.
https://wiki.ivoa.net/twiki/bin/view/IVOA/TableAccess
Since: 2.4.1

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.
Since: 1.3.0

TeamLeader
An individual who is the designated leader of an investigation.
Since: 1.0.0

TeamMember
An individual who is a major participant in an investigation.
Since: 1.0.0

TechnicalContact
An individual who can provide specific information with regard to the resource or supporting software.
TechnicalNote
A document summarizing the performance and other technical characteristics of a product, machine, component, subsystem or software in sufficient detail to be used by an engineer or researcher.
Since:2.2.2

Telemetry
Parameters that include full packets of data from monitoring devices or the memory addresses of datum within telemetry packets. The data comprising telemetry packets are typically expressed by using non-physical engineering units and may be used to express a variety of device operating conditions such as command acceptance/execution, housekeeping, event characterization, memory dumps, and science data. Telemetry packets may be raw or unpacked.
Since:2.3.2

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).
Since:1.0.0

Template
A URI template that contains special fields as defined in URI Template specification <http://tsds.org/uri_templates>.
Since:2.3.0

Temporal
Pertaining to time.
Since:1.0.0

TemporalDescription
A characterization of the time over which the measurement was taken.
Since:1.0.0

Sub-elements
TimeSpan
Cadence
CadenceMin
CadenceMax
Exposure
ExposureMin
ExposureMax

Used by: DisplayData
NumericalData

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.

Since: 1.2.0

Tethys

The third largest moon of Saturn.

Since: 2.2.5

Text

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

Since: 1.0.0

Allowed Values ASCII Unicode

TFCat

Time-Frequency Catalogue (TFCat) is a catalogue model & transfer format for spectro-temporal features. https://gitlab.obspm.fr/maser/catalogues/catalogue-format

Since: 2.4.1

ThermalPlasma

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

Since: 1.0.0

ThermalSpeed

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

Since: 1.0.0

Thermosphere

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

Since: 1.2.0

Thumbnail

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

Since: 1.3.1
**TIFF**
A binary format for still pictures. Tagged Image Format File (TIFF). Originally developed by Aldus and now controlled by Adobe.
   Since:1.0.0

**TIIS**
Kronian Solar Orbital - A coordinate system related to Saturn where X is anti-sunward, Y along the orbital velocity direction.
   Since:2.2.5

**TimeOfFlight**
An instrument which measures the time it takes for a particle to travel between two detectors.
   Since:1.2.1

**TimeSeries**
A representation of data showing a set of observations taken at different points in time and charted as a time series.
   Since:1.3.1

**TimeSpan**
The duration of an interval in time.
   Since:1.1.0
   Sub-elements **StartDate**
   **StopDate**
   **RelativeStopDate**
   **Note**
   Used by: **Annotation** **Catalog** **TemporalDescription**

**Titan**
The largest moon of Saturn and the second-largest moon in the Solar System.
   Since:2.2.5

**Titania**
The largest moon of Uranus and the eighth largest moon in the Solar System.
   Since:2.2.5

**Topside**
The region at the upper most areas of the ionosphere.
   Since:1.2.0
**Total**
The summation of quantities over all possible species.
   Since:1.3.6

**TotalPressure**
In an MHD fluid it is the number density (N) times Boltzmann constant times the temperature in Kelvin.
   Since:1.3.5

**Trace**
The sum of the elements on the main diagonal (the diagonal from the upper left to the lower right) of a square matrix.
   Since:1.3.1

**TransitionRegion**
A very narrow (<100 km) layer between the chromosphere and the corona where the temperature rises abruptly from about 8000 to about 500,000 K.
   Since:1.0.0

**Triton**
The largest moon of Neptune.
   Since:2.2.5

**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.
   Since:1.2.0

**UCD**
The nature of a physical parameter expressed using the IVOA UCD1+ controlled vocabulary.
   Since:2.2.9
   Used by: Parameter

**UDF**
   Since:1.0.0

**Ultraviolet**
Photons with a wavelength range: 10 to 400 nm.
Umbriel
The third largest and fourth most massive moon of Uranus.

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. Similar to NASA Level 1.

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

Unicode
Text in multi-byte Unicode format.

Units
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) 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>

Used by: AzimuthalAngleRange
  DataExtent
  Element
  EnergyRange
  FrequencyRange
  InputProperty
  MassRange
  OutputProperty
  Parameter
  PitchAngleRange
  PolarAngleRange
Wavelength Range

UnitsConversion

The multiplicative factor for converting a unit into International System of Units (SI) units. The factor is expressed in the form "number > x", where "number" is a numerical value and "x" is the appropriate SI units. The basic SI units are Enumerated: m (meter), N (newton), kg (kilogram), Pa (pascal), s (second), Hz (hertz), A (ampere), V (volt), K (kelvin), W (watt), rad (radian), J (joule), sr (steradian), C (coulomb), T (tesla), ohm (ohm), mho (mho or seimens), H (henry), and F (farad). Two useful units which are not SI units are: degree (angle), and unitless (no units). An example is: "1.0E-9>T" which converts the units, presumable nT, to Tesla. Another example is: "1.0e+3>m/s" which converts a velocity expressed in kilometers per second to meters per second.

Since:1.0.0

Used by: Element
Parameter

Unlikely

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

Since:1.3.6

Unspecified

A value which is not provided.

Since:1.2.1

UpperHybridFrequency

Upper hybrid oscillations involve longitudinal motions of electrons perpendicular to the magnetic field. The upper hybrid frequency, $\Phi_{UH}$, is governed by the relationship $\Phi_{UH}^2 = \Phi_{pe}^2 + \Theta_{ce}^2$ where $\Phi_{pe}$ is electron plasma frequency and $\Theta_{ce}$ is the electron cyclotron frequency.

Since:2.3.1

Uranus

The eighth planet from the sun in our solar system.

Since:1.2.0

Allowed Values Ariel
Magnetosphere
Magnetosphere.Magnetotail
Magnetosphere.Main
Magnetosphere.Plasmasphere
Magnetosphere.Polar
Magnetosphere.RadiationBelt
Magnetosphere.RingCurrent
Miranda
Oberon
**URL**

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.

Since: 1.0.0

Used by: AccessURL, InformationURL, Installer, Source

**User**

An individual who utilizes a resource or service.

Since: 2.3.1

**ValidMax**

The largest legitimate value.

Since: 1.2.0

Used by: Element, InputProperty, OutputProperty, Parameter

**ValidMin**

The smallest legitimate value.

Since: 1.2.0

Used by: Element, InputProperty, OutputProperty, Parameter

**ValueAdded**

Calibrated data that has been mapped on uniform space-time grid scales with gaps, flags and out-of-range values replaced with appropriate values. Similar to NASA Level 3.

Since: 2.4.0

**ValueFormat**

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.

Since:1.3.1

Used by: RenderingHints

Variance

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

Since:1.0.0

VCrossB

The cross product of the charge velocity (V) and the magnetic field (B). It is the electric field exerted on a point charge by a magnetic field.

Since:1.3.5

Vector

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

Since:1.0.0

Velocity

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

Since:1.0.0

Venus

The second planet from the sun in our solar system.

Since:1.2.0

Allowed Values Magnetosphere

Magnetosphere.Magnetotail
Magnetosphere.Main
Magnetosphere.Plasmasphere
Magnetosphere.Polar
Magnetosphere.RadiationBelt
Magnetosphere.RingCurrent

Version

Indicates the release identifier. When used to indicate the release of the SPASE data model, it is 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).
Since: 1.0.0

**Vertical**

Perpendicular to the plane of the horizon or a base line.

Since: 2.2.0

**VolumeEmissionRate**

The volume emission rate, \( e(r, t, l) \), is the number of photons emitted per unit source volume per second, i.e. photons/(m\(^3\) s), as measured along the line of sight between the source point and the observer. The Volume Emission Rate is in general a function of the line-of-sight distance, \( r \), time, \( t \), and wavelength, \( l \). The Volume Emission Rate is actually not a directly measurable quantity. However, the term has been commonly used in both data product descriptions and research publications.

Since: 2.3.2

**VOTable**

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

Since: 1.1.0

**VSO**

Venus Solar Orbital - A coordinate system related to Venus where X is anti-sunward, Y along the orbital velocity direction.

Since: 2.2.4

**Wave**

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

Since: 1.3.5

Sub-elements **WaveType**, **Qualifier**, **WaveQuantity**, **EnergyRange**, **FrequencyRange**, **WavelengthRange**

Used by: **Parameter**

**WaveForm**

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

Since: 1.3.5

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

Since: 1.0.0

**Wavelength**

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

Since: 1.3.5

**WavelengthRange**

The range of possible values for the observed wavelength.

Since: 1.3.0

Sub-elements **SpectralRange**

- **Low**
- **High**
- **Units**
- **Bin**

Used by: **Wave**

**WaveQuantity**

A characterization of the physical properties of a wave.

Since: 1.3.5

Allowed Values **Absorption**

- **ACElectricField**
- **ACMagneticField**
- **Albedo**
- **DopplerFrequency**
- **Emissivity**
- **EnergyFlux**
- **EquivalentWidth**
- **Frequency**
- **Gyrofrequency**
- **Intensity**
- **LineDepth**
- **LowerHybridFrequency**
- **MagneticField**
- **ModeAmplitude**
- **PlasmaFrequency**
- **Polarization**
- **PoyntingFlux**
- **PropagationTime**
- **StokesParameters**
- **UpperHybridFrequency**
- **Velocity**
**VolumeEmissionRate**

**Wavelength**

Used by: **Wave**

**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.

Since: 1.3.4

Allowed Values: **Active**
- **Passive**

**WaveType**

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

Since: 1.3.5

Allowed Values:
- **Electromagnetic**
- **Electrostatic**
- **Hydrodynamic**
- **MHD**
- **Photon**
- **PlasmaWaves**

Used by: **Wave**

**Weak**

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

Since: 1.3.6

**WebResource**

A Web page or file based resource accessible by a URL.

Since: 2.4.1

**WebService**

A Web-based service that uses SOAP, WSDL or UDDI open standards.

Since: 2.3.0

**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.
Since: 1.2.0

**WhiteLight**
Photons with a wavelength in the visible range for humans.
Since: 1.0.0

**WhitePaper**
An authoritative report giving information or proposals on an issue.
Since: 2.2.2

**XML**
Since: 1.0.0

**X Rays**
Photons with a wavelength range: 0.001 <= x < 10 nm.
Since: 1.0.0

**ZIP**
An open standard for compression which is a variation of the LZW method and was originally used in the PKZIP utility.
Since: 1.0.0
## 10. History

### 2.4.1

- **2022-05-19** Released.
- **2022-05-05** Update definitions of MeasurementType, PublicationDate, PublicationInfo and PublishedBy.
- **2022-04-28** Add Remark and WebResource to dictionary; Add Remark, WebResource, WebService to SupportQuantity enumeration.
- **2022-04-20** Add InstrumentScientist to dictionary and to Role enumeration; fix definition of Longitude.
- **2022-02-24** Make Annotation.PhenomenomType zero or more occurrences (*); Make Observatory.Location one or more occurrences (+)
- **2021-10-14** Add Git, TAP, EPNTAP to dictionary and to Style enumeration; add TFCat, RINEX2 and RINEX3 to dictionary and Format enumeration; Add Author to dictionary and to Role enumeration.

### 2.4.0

- **2021-06-10** Released.
- **2021-04-29** Add ValueAdded to the dictionary; Add ValueAdded to ProcessLevel.
- **2021-04-29** Change Format in AccessInformation to have one or more occurrence.
- **2021-04-29** Add Policy and Convention to dictionary and to DocumentType enumeration
- **2021-02-04** Change Version to SoftwareVersion in Software resource; Add elements to InputProperty and OutputProperty.
- **2020-11-12** Add Software resource and related elements to the information model.

### 2.3.2

- **2020-10-15** Released.
- **2020-10-08** Add InstrumentLead to dictionary and to Role.
- **2020-09-30** Add InstrumentGroupID and Experiment to dictionary; Add InstrumentGroupID to Instrument and Experiment to InstrumentType.
- **2020-09-10** Add Housekeeping, Telemetry, RotationMatrix, EncodedParameter, AutoSpectrum, Coherence, ImaginaryPart, RealPart, PowerSpectralDensity, ChargeFlux, DynamicPressure, EnergyPerCharge, ParticleRigidity, MassPerCharge, LShell, MissionPrincipalInvestigator, ProgramManager, ProgramScientist, VolumeEmissionRate, SPICE, MissionManager to dictionary and to appropriate enumerations as suggested by L. Bargatze; Add PDS4 and PDS3 to dictionary and to Format enumeration as suggest by A. Masson.

### 2.3.1

- **2019-11-14** Released.
- **2019-10-31** Add CoPI, MidLatitudeRegion, SubAuroralRegion, ProjectEngineer, and ProjectManager to dictionary; Add CoPI, ProjectEngineer, ProjectManager to Role enumeration; Add Plasmasphere, RingCurrent, and MidLatitudeRegion to Magnetosphere enumeration.; Add MidLatitudeRegion, and ProjectManager to NearSurface enumeration.; Fix typo with Role values with dashes.
- **2019-09-27** Add DirectionCosine, GeometricFactor, AdiabaticInvariant, MagneticMoment, BounceMotion, DriftMotion, DataQuality, Orientation, SpinPeriod, SpinPhase, SpinRate, LowerHybridFrequency and UpperHybridFrequency to dictionary.; Create DirectionCosine enumeration with I,J,K as members; Create
AdiabaticInvariant enumeration with MagneticMoment, BounceMotion and DriftMotion as members.; Add DirectionCosine to Qualifier list.; Add GeometricFactor, AdiabaticInvariant to ParticleQuantities; Add DataQuality, Orientation, SpinPeriod, SpinPhase and SpinRate to SupportQuantity.; Add LowerHybridFrequency and UpperHybridFrequency to WaveQuantity.

2019-06-13 Add RevisionHistory, RevisionEvent to dictionary and add RevisionHistory to ResourceHeader; Add IonGauge to dictionary and to InstrumentType.

2019-06-13 Add StartDate, StopDate and Note to Contact.

2019-02-25 Add Developer, HostContact and User to dictionary and Role list.

2018-11-01 Add Positron to dictionary and ParticleType list.

2018-06-18 Add Eccentric Dipole (ECD) to dictionary and CoordinateSystem list.

2.3.0

2018-05-31 Released.
2018-05-08 Add File, HAPI, Listing, Search, Template, Overview, WebService to dictionary and as values for Style enumeration.; Add Style to dictionary and AccessURL
2018-05-04 Add PublicationInfo, PublicationDate, Authors, Funding, Agency, Project, Award, ORCID to dictionary and to the model.

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

2.2.9

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

2.2.8

2016-07-21 Released.

2.2.7

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

2.2.6

2015-09-09 Released.

2.2.5

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

2.2.4

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

2.2.3

2014-05-22 Released.
2012-05-24 Add definition of "Moon" and add to "Earth" enumeration as suggested by T. Narock.
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 "Instrument Type" as suggested by B. Weigel.
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

2.2.2 Released.
2012-02-27 Add "Albedo" to the dictionary and to "Wave Quantity" list.; Add "Partial Radius" to the dictionary and to the "Particle Quantity" list;
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";
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).

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

2.2.0 Released.
2011-01-06 Updated definition for "irradence".
2011-01-06 Added "SSE_L" to dictionary and to "Coordinate System Name" list;
2010-09-17 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 "Qualifier" list.;
2010-08-20 Updated definitions of "Outer", "Inner", "Heliosheath" and "Remote 1AU"
2010-08-17 Added "S3_BUCKET" to dictionary and "Encoding"; Add "Directional" to dictionary and to "Qualifier"; updated definition for "Energy Flux" and "Differential"
2010-06-25 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"
2010-05-21 Added "Heliosheath" to dictionary and to "Heliosphere" enumeration;
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";

2.1.0
2010-03-19 Released.

2.0.3
2010-03-19 Updated definitions for "Number Flux", "Energy Flux", "Differential", and "Integral"; Added "Dust" to "Measurement Type" enumeration;
2010-02-04 Added "Former-PI" to dictionary and to "Role" enumeration; Added "Note" to "Person".

2.0.2
2009-11-18 Modified definitions for "Observatory" and "Instrument".
2009-11-05 Added "Stream Interaction Region" to dictionary and to "Phenomenon Type" enumeration. Updated definition of "Coronal Mass Ejection".
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".
2009-09-24 Added "Atomic Number Detected", "Mass Number" and "Charge State" to dictionary and to "Particle Quantity" enumeration. Also added "Direction Angle" to "Particle Quantity".

2.0.1
2009-07-12 Updates to the definition "Access URL", "Data Extent", "Polar" and "Sonic Mach Number".
2009-07-12 Added "Sound Speed" to dictionary and to "Particle Quantity".
2009-07-12 Update the description of "Index" data type to explain wild cards.
2009-07-12 Under "Element" replaced "Component" with "Qualifier" and allow multiple occurrences.
2009-07-12 Changed "Rendering Hints" to 0-to-many occurrence.

2.0.0
2009-04-15 Released.

1.3.6
2009-04-09 Added "Child Event Of" and "Observed By" to "Association Type".
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 "Classification Method" as a enumeration with allowed values of "Automatic", "Inspection", and "Inferred". Added "Classification Method" to "Annotation".
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 "Particle Type" to "Mixed".
2009-04-09 Added "Array" and "Total" to "Qualifier".
2009-04-09 Added "Atom" and "Neutron" to "Particle Type".

1.3.5

2009-04-06 Removed "Spectral Range" from under "Energy Range".
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 Added "Plasmagram", "Spectrogram" and "Wave Form" to the dictionary and to the "Display Type" list.
2009-03-26 Various editorial updates to definitions, spelling and typos
2009-03-26 Added "Image URL" to "Annotation" and dictionary
2009-03-26 Added "Access URL" to "Repository" and "Registry".
2009-03-25 Updated definitions for "Numeric" and "Text" data types.

1.3.4

2009-02-27 Change "Wave" to "Waves".
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.
2009-02-05 Added "Psuedo" and "Column" to the dictionary and to "Qualifier" list.
2009-02-05 Changed "Line-of-sight" to "Line Of Sight".
2009-02-05 Added (restored) "Intensity" to dictionary and "Photon Quantity" list.
2009-01-23 Added "Ion Chamber" to dictionary and "Instrument Type" list.
2009-01-22 Changed occurrence of "Particle" to one or more.
2009-01-22 Modified definition of "Mixed"
2009-01-14 Changed the definition of "Text" and converted "Text" to an enumeration with
possible encoding types.

2009-01-14 Added "Language" under "Information URL".

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.


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.

1.3.2

2008-10-15 Changed "Format" under "Rendering Hints" to "Value Format" to eliminate name conflict with "Format".

2008-10-07 Added "Interstellar" to dictionary and Region.

2008-10-07 Removed "Charged Particle Flux" from Measurement Type and the dictionary.

1.3.1

2008-09-04 Added "Count Rate" to the dictionary and to "Particle Quantity".

2008-09-04 Added "Velocity" to "Support Quantity".

2008-09-04 Removed "Measured" and shifted containers under "Measured" up one level.

2008-09-04 Changed "Physical Parameter" to "Parameter".

2008-09-04 Added "Symmetric" to the dictionary and to Qualifier.

2008-09-04 Added "Rendering Hints" with elements Format, AxisLabel, DisplayType, ScaleMin, ScaleMax, ScaleType and related enumerated values.

2008-07-31 Added "Platform" to the dictionary and to the "Instrument Type" list, remove "Ephemeris" from the "Instrument Type" list.

2008-07-31 Added "Ion Drift" and "Dust Detector" to the dictionary and to the "Instrument Type" list.

2008-07-31 Added "Set" to "Physical Parameter".

2008-07-31 Added "Trace" to the dictionary and to the "Qualifier" list.

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 "Source Type" as a list with possible values of Data, Layout, Ancillary, Browse and Thumbnail.

2008-07-31 Added "Source" dictionary and to "Granule", Removed URL, Checksum and Data Extent from Granule (now in Source)

2008-07-31 Added "Set" to "Physical Parameter".

2008-07-21 Updated description of duration type.

1.3.0

2008-11-22 Released.

2008-05-22 Removed "Array" from the Field, Photon and Particle qualifier lists.


2008-05-22 Added "EIT Waves" to dictionary and "Phenomenon Type".

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

1.2.2

2008-08-14 Released.
2008-07-31 Added Repository ID and Stop Date.
2008-07-31 Added "Ionosphere" as a list.
2008-07-31 Remove "Near Earth" as a list.
2008-07-31 Remove "Field Component" from lists.
2008-07-31 Removed "Offline" from "Medium".
2008-07-31 Change "Observatory Group" to "Observatory Name".
2008-07-31 Change "Time-of-flight" to "Time of flight".
2008-07-31 Change "Retarding Potential Analyser" to "Retarding Potential Analyzer".
2008-07-31 Change "Plasmafrequency" to "Plasma Frequency".
2008-07-31 Change "Plasmafrequency" to "Plasma Frequency".

1.2.1

2008-03-20 Released.
2008-03-20 Removed Flux and Intensity.

185
1.2.0

2008-03-20  Updated definitions of Vector and Size.
2008-03-20  Added Carrington and HCI to Coordinate System.
2008-03-20  Added Anisotropy to Particle Qualifier.
2008-03-20  Added Energy Flux to Particle Quantity and Photon Quantity.
2008-03-20  Added Flow Speed, Number Flux to Particle Quantity.
2008-03-20  Added Archive Specialist to Role.
2008-03-20  Added Time Of Flight Interferometer, Photometer, Radiometer, Coronograph, ProportionalCounter, ScintillationDetector, Photopolarimeter, Geiger-Mueller Tube, Neutral Particle Detector, Sounder, Neutral Atom Imager, Retarding Potential Analyser, Multispectral Imager, Imaging Spectrometer, Riometer, Unspecified to Instrument Type.
2008-03-20  Add Energy Range and Wavelength Range to Photon Quantity.
2008-03-20  Added Characteristic to Particle Qualifier.
2008-03-20  Added Current, Gyro Frequency, Energy, Plasma Frequency to the appropriate Particle Quantity, Field Quantity, or Photon Quantity.
2008-03-20  Added Parallel and Phase Angle to Field Qualifier.
2008-03-20  Added Spacecraft Orbit Plane to Coordinate System Name.

1.2.0

2007-05-22  Released.
2007-05-22  Added WGS84 as a Coordinate System Name.
2007-05-22  Added ITM regions under Near Surface.
2007-05-22  Added Location container under Observatory and added the elements Latitude, Longitude, Elevation, Observatory Group.
2007-05-22  Added "Theta" and "Phi" to "Component".
2007-05-22  Added "Spectrum" to "Measurement Type".
2007-05-22  Removed "Dynamic Spectra" from "Measurement Type".
2007-05-22  Under "Physical Parameter" made "Parameter Key" optional and "Name" required.
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  Added "Extension" as a container.
2007-05-22  Added Postscript as a Format.
2007-05-22  Added Processing Level, Removed Theta and Phi.
2007-05-22  Converted Support to an enumeration with Other, Positional and Temporal as members.
2007-05-22  Added Instrument Status to Measurement Type.
2007-05-22  Made Component and enumeration with the values from Orientation.
2007-05-22  Added Element under Dimension.
2007-05-22  Added Element with members of Name, Index, Parameter Key and Component.
2007-05-22  Added Deputy-PI to Roles; Changed cardinality of Caveats under Instrument to optional.
2007-05-22  Cardinality of Access Information changed from 1 to + (1 or more).
2007-05-22  Added Metadata Contact to Role.
2007-05-22  Changed InstrumentId in DisplayData and NumericalData to one or more occurrences.
2007-05-22  Added Sequence as an element type and changes Size to a Sequence.
2007-05-22  Added Ephemeris as an Instrument Type.
2007-05-22  Updated Phi and Theta definitions.
2007-05-22  Added Longitude and Latitude to Orientation.
2007-05-22  Added Expiration Date to Resource Header and Granule.
2007-05-22  Added Uncertainty and Standard Deviation to qualifiers.
2007-05-22  Added the ValidMin, ValidMax and FillValue to Physical Parameter.
2007-05-22  Added Data Extent to Access URL and Granule.
2007-05-22  Added Data Extent, Bytes and Per to describe the size of a resource.
2007-05-22  Added all planets, Comet and Asteroid as regions.
2007-05-22  Added Note as a term and added Note under Timespan.
2007-05-22  Added Checksum, Hash Value, Hash Function, MD5 and SHA1, SHA256.
2007-05-22  Added Aurora and Substorm under Phenomenon Type.

1.1.1
2007-01-31  Changed AccessURL to type container.
2007-01-31  Modified definition of Units.
2007-01-31  Changed InstrumentID and Bin to multiple occurrence.

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

1.0.3
2006-04-27 Released.
2006-04-27 Correct links to "Stoke's Parameters".
2006-04-27 Added "Near Earth" under "Heliosphere" and added "Outside Bowshock" and "Orbital" under "Near Earth".
2006-04-27 Moved Mass and Size under "Particle Physical Quantity" and changed to type item.
2006-04-27 Dropped N, Z, Q from dictionary.
2006-04-27 Added "NCAR" as a "Format".
2006-04-27 Change "HF Radar" to "Radar".
2006-04-27 Made "Acknowledgement" options.
2006-04-27 Move "Access Rights" under "Access Information".
2006-04-27 Changed definition of "Item" to indicate it is a value of an enumeration.
2006-04-27 Changed "Observed Region" and "Instrument Region" to enumerations.
2006-04-27 Added "Earth" as a enumeration with "Magnetosphere" as a member.

1.0.2
2006-03-07 Released.
2006-03-07 Added "Registry" resource class.
2006-03-07 Added "Repository" resource class.
2006-03-07 Added "Caveats" under "Instrument".
2006-03-07 Added "Project Scientist" to dictionary and "Role".

1.0.1
2006-01-03 Released.
2006-01-03 Added elements: Pressure.
2006-01-03 Changes in value type for elements: Exposure, InputResourceID, RepositoryName, Size.

1.0.0
2005-11-22 Released.
2005-11-22 Added Phenomenon Type list and defined terms in the list.
2005-11-22 Incorporate comments from consortium members on the "final" draft before the release of version 1.0.

0.99.9
2005-11-18 Released.
<table>
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<th>Date</th>
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<td>2005-11-18</td>
<td>Incorporate comments from consortium members on the &quot;final&quot; draft before the release of version 1.0</td>
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<tr>
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<td>2005-11-03</td>
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<td>2005-11-03</td>
<td>General clean-up and alignment with the schema agreed upon at the APL meeting (Nov 2-4, 2005)</td>
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<td>2005-09-08</td>
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<tr>
<td>2005-09-08</td>
<td>Change &quot;Acceptable abbreviation&quot; to &quot;Conventional abbreviation&quot; since abbreviations are not supported in the model.</td>
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<tr>
<td>2005-09-08</td>
<td>Update definition of Magnetotail, etc. to be generic, add Earth examples.</td>
</tr>
<tr>
<td>2005-09-08</td>
<td>Add all planets + Moon under Body.</td>
</tr>
<tr>
<td>2005-09-08</td>
<td>Add Near 1AU under Heliosphere; Add Body under Atmosphere-Ionosphere, Magnetosphere and Ground.</td>
</tr>
<tr>
<td>2005-09-08</td>
<td>Add Wave Form, Spectra etc. under Analysis Method.</td>
</tr>
<tr>
<td>2005-09-08</td>
<td>Add Analysis Method under Field/Electric and Field/Magnetic.</td>
</tr>
<tr>
<td>2005-09-08</td>
<td>Move Polar Angle under Particle Independent Variable.</td>
</tr>
<tr>
<td>2005-09-08</td>
<td>Drop Speed from Particle Independent Variable.</td>
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<tr>
<td>2005-09-08</td>
<td>Move Wavelength and Wave Number under Photon Independent Variable.</td>
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<tr>
<td>2005-09-08</td>
<td>Change Photon Context and Particle Context to Independent Variable.</td>
</tr>
<tr>
<td>2005-09-08</td>
<td>Under Parameter add Description, Tensor Order.</td>
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<tr>
<td><strong>0.99.6</strong></td>
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<tr>
<td>2005-09-07</td>
<td>Removed &quot;Provider&quot; and &quot;Manufacture&quot; resources and replaced with ID pointers.</td>
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<tr>
<td>2005-09-07</td>
<td>Introduced &quot;Photon Context&quot; and &quot;Particle Context&quot; as replacements for &quot;Independent Variable&quot;.</td>
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<tr>
<td>2005-09-07</td>
<td>Change Upper Latitude to High Latitude, Lower to Low.</td>
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<tr>
<td>2005-09-07</td>
<td>Remove Ratio (Numerator and Denominator).</td>
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<tr>
<td>2005-09-07</td>
<td>Added Spherical and Cartesian under Position.</td>
</tr>
<tr>
<td>2005-09-07</td>
<td>Removed Body and references to it.</td>
</tr>
<tr>
<td>2005-09-07</td>
<td>Changed Surface to Ground.</td>
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<tr>
<td>2005-09-07</td>
<td>Corrected the inclusion of Atmosphere-Ionosphere regions into the Magnetosphere.</td>
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<td>2005-08-26</td>
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<tr>
<td>2005-08-26</td>
<td>Add parameters loosely based on a model proposed by A.Roberts.</td>
</tr>
<tr>
<td>2005-08-26</td>
<td>Included region descriptions from J. King with additions suggested by K. Reardon.</td>
</tr>
<tr>
<td>2005-08-26</td>
<td>Added catalog, display data to top list.</td>
</tr>
<tr>
<td>2005-08-26</td>
<td>Added document elements to product resources.</td>
</tr>
<tr>
<td>2005-08-26</td>
<td>Changed data types of &quot;Integer&quot; to &quot;Count&quot; and &quot;Double&quot; to &quot;Numeric&quot;.</td>
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<tr>
<td>2005-08-26</td>
<td>Clarified some definitions and corrected typographical errors based on comments from J. Thieman and J. Hourcle.</td>
</tr>
<tr>
<td><strong>0.99.4</strong></td>
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<tr>
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2005-08-08  Added definitions for new elements introduced in the new taxonomy.
2005-08-08  Restructured the taxonomy of elements to match the one suggested by A. Roberts.

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

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

0.99.1
2005-06-23  Released.
2005-06-23  Particle Correlator and Spacecraft Potential Control.
2005-06-23  Added Chris Harvey's definitions for Electron Drift.
2005-06-23  Removed duplicate entries.
11. 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
   - or -
   - or -
RFC 3339 - Date and Time on the Internet
RFC 1014 - XDR: External Data Representation standard
   http://www.faqs.org/rfcs/rfc1014.html
12. Appendix A - Comparison of Spectrum Domains

<table>
<thead>
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<td>max</td>
<td>min</td>
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<td>0.001</td>
<td>-</td>
</tr>
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<td>Far IR</td>
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</tr>
<tr>
<td>Microwaves</td>
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<td>1.5*10⁷</td>
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<tr>
<td>Radio</td>
<td>10⁶</td>
<td>10¹¹</td>
<td>10⁹</td>
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¹ Also called “XUV” in ISO 21348