



# SPASE Information Model WG Update

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and

The SPASE Group

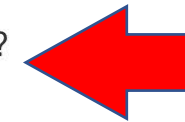
Presented at the 8<sup>th</sup> IHDEA Meeting, European Space Astronomy Centre (ESAC), Madrid, Spain, October 17-18, 2024

## The SPASE Group ([spase@groups.io](mailto:spase@groups.io))

- Community group responsible for developing & maintaining the SPASE information model
- Meets bi-weekly, virtually
- Open to all interested (see [About](#))

## Support

Need advice or more information about using the SPASE Information Model?  
Send an [email](mailto:spase-support@groups.io) ([spase-support@groups.io](mailto:spase-support@groups.io)) to our experts.

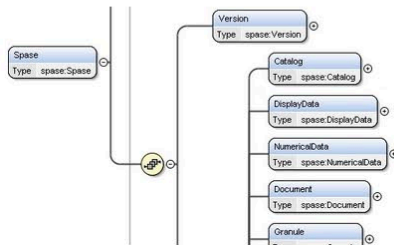


For questions & suggestions:

[spase-support@groups.io](mailto:spase-support@groups.io)

## Announcements

2024-06-24: Version 2.6.1 of the SPASE [Base model](#) is released. 2.6.1 updated 2024-9-05



## Data Model

Get details of the SPASE [Data Model](#), which provides terms and syntax for uniform descriptions of Heliophysics resources, including Observatories, Instruments, People, Repositories, and (most centrally) Numerical Data products, / extended set of terms deals with [simulations and models](#). A Dictionary of the terms is provided, along with the [XML schema](#) documents used to validate SPASE descriptions. Use of the SPASE [base data model](#) along with the [simulation extensions](#) are a COSPAR [recommendation](#).



## Documents

Specifications for [event lists](#) (and catalogues) and endorsed [conventions](#) for [text markup](#), [resource ID formation](#), and guidelines with dealing with [plain text data](#) within SPASE descriptions.

# Changes from SPASE 2.6.0 to 2.6.1 (6/2024; rev. 9/2024)

(see change history @ <https://spase-group.org/data/model/history.html>)

- New SPASE terms : Muon in **ParticleType**; AOGCM, GCM, NonHydrostatic and Electrodynamic in **ModelType**; InterplanetaryCoronalMassEjection in **PhenomenonType**; LocalGeographic, LocalGeomagnetic, SensorCoordinates, and StonyhurstHeliographic in **CoordinateSystemName**; Lidar to the **InstrumentType**; and SourceRegion and SourceRegionExtent to **Particle** and **Wave Containers**
- Updated SPASE dictionary definitions: Acknowledgement, Association Type, Author, Authors, DirectionAngle, Encoding, FlowSpeed, FlowVelocity, Format, MagneticCloud, PublicationDate, ReleaseDate, ResourceName, Style, and ThermalSpeed
- Corrected SPASE Ontology listing of Cardinality:
  - RepositoryID under AccessInformationOptional from letter r to 1(required);
  - SpatialCoverage under DisplayData and Granule from + (1 or more) to \*(0 or more);
  - SpatialCoverage under Member and Parameter from 0 (optional) to \*(0 or more);
  - OperatingSpan under Observatory from + (1 or more) to \* (0 or more);
  - OperatingSpan under Instrument from 0 (optional) to \*(0 or more);
  - ModelType under Model from 1(required) to +(1 or more).
- Corrected the deletion error of PopulationChargeState in the Particle container.

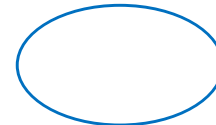
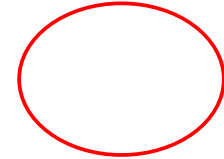
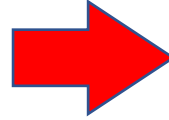
# Open SPASE Registry

A federated collection of SPASE metadata hosted on [Github](#) for sharing.

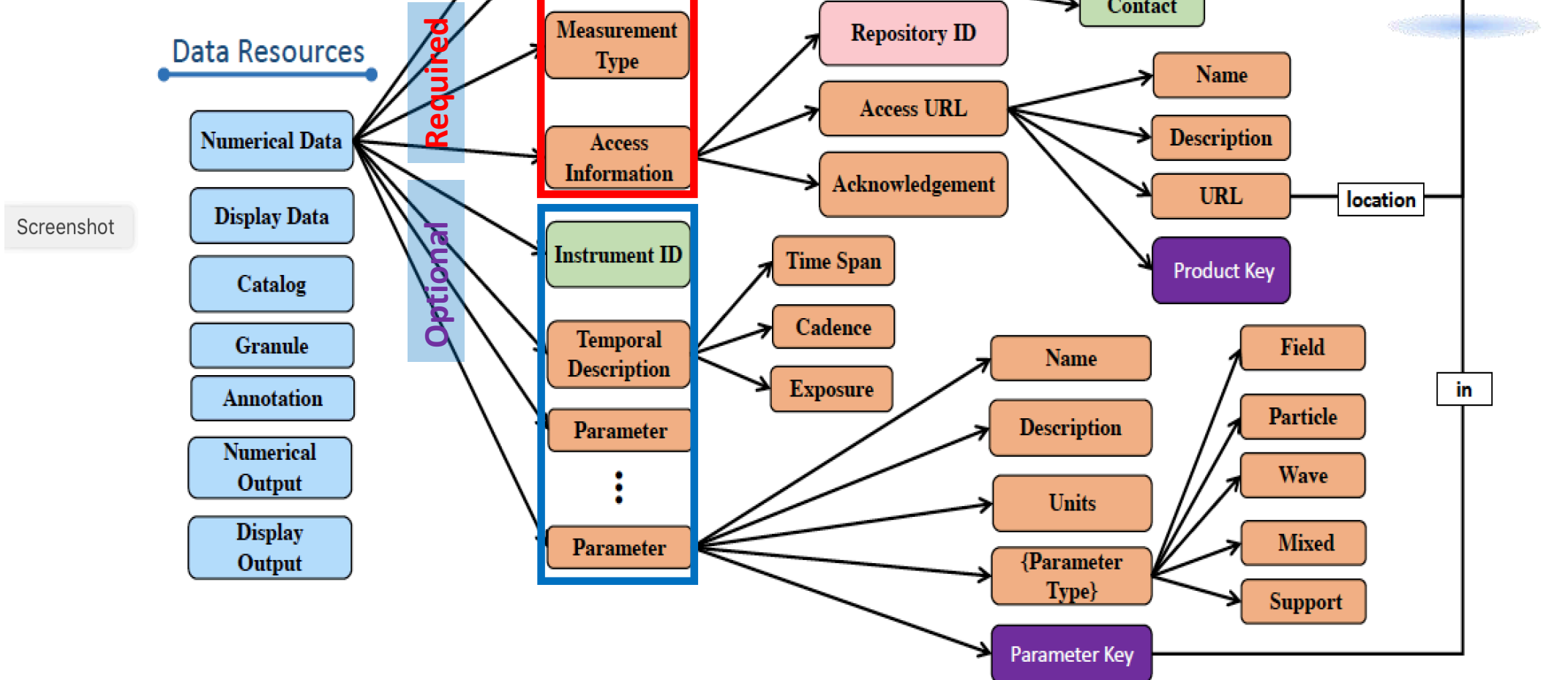
- Organized by *NamingAuthority (NA)* & *ResourceType*
- *NAs* are typically resource-commissioning entities
  - 21 *NAs* (see <https://spase-group.org/services/naming-authority.html>)
  - Programmatic tracking of SPASE records
  - Registration status (10/07/24):

|                    |            |            |
|--------------------|------------|------------|
| NumericalData 7558 | Catalog 45 | Service 29 |
| DisplayData 625    | Software 4 | Model 2    |

- Responsible *NAs* (or **designated representatives**) provide effective management of *SPASE* records, **with each resource (e.g., dataset, model, etc.) uniquely identified by a ResourceID.**
- *SPASE* landing pages (hosted on [hpde.io](http://hpde.io)) provide **persistent, citable references** of resource DOIs.



# Resource Description Overview



Screenshot

# Reorganizing *NASA*, *SMWG*, & *GBO* Naming Authorities: Migration of Legacy SPASE Resources

- Many non-NASA legacy resources (e.g., from VxOs) are currently registered under *NASA*.
  - Resources not commissioned by NASA need to be migrated to their appropriate *Naming Authorities*.
- *SMWG* & *GBO* are not resource commissioning entities, thus are not valid *Naming Authorities* for products.
  - All *non-Person* resources (e.g., *Observatory*, *Instrument*, *Repository*, etc.) need to be migrated to their rightful *Naming Authorities*.
  - *SMWG* will be the *NA* for *Person* resources only.
  - *GBO* will be deprecated after migration of all underlying resources.
- Migrated *SPASE* resources will have new *ResourceIDs* (changing *NAs*)
  - Old *ResourceIDs* will become *PriorIDs*.
  - References to Old *ResourceIDs* can be easily updated.
  - *RevisionHistory* will document all changes.
  - Resource migration will not affect *DOI* references (and citations).

# SPASE Document as Landing Page of DOI Reference

## Issues requiring coordination between repositories:

- 1) Duplicate *ResourceIDs* [same dataset (e.g., from *ACE* or *Cluster*) registered under different NAs.]
- 2) Inconsistent resource references & acknowledgments
- 3) *SPASE* and *ResourceID* updates

**Data Access**

- [FTPS from the MMS SDC \(not with most browsers\)](#)
- [HTTPS from the MMS SDC](#)
- [FTPS from SPDF \(not with most browsers\)](#)
- [HTTPS from SPDF](#)
- [CDAWeb](#)
- [HAPI: CDAWeb HAPI Server](#)

**MMS 1 Flux Gate Magnetometer (FGM) DC Magnetic Field, Level 2 (L2), Burst Mode, 128 Sample/s, v4/5 Data**

Russell, Christopher, T.; Magnes, Werner; Wei, Hanying; Bromund, Kenneth, R.; Plaschke, Ferdinand; Fischer, David; Strangeway, Robert, J.; Leinweber, Hannes, Karl; Eichelberger, Hans, Ulrich; Huang, B.G.; Le, Guan; Burch, James, L. (2022). MMS 1 Flux Gate Magnetometer (FGM) DC Magnetic Field, Level 2 (L2), Burst Mode, 128 Sample/s, v4/5 Data [Data set]. NASA Space Physics Data Facility. <https://doi.org/10.48322/pj0n-m695>. Accessed on 2024-October-11.

Note: Proper references, including those in [BibTex](#) or [other formats](#), should include the "Accessed on date" as shown above to identify the version of the resource being cited in a given publication.

**ResourceID**  
spase://NASA/NumericalData/MMS/1/FIELDS/FGM/Burst/Level2/PT0.0078125S

**Description**  
The Fluxgate Magnetometers (FGM) on Magnetospheric Multiscale consist of a traditional Analog Fluxgate Magnetometer (AFG) and a Digital Fluxgate magnetometer (DFG). The dual magnetometers were used to create a merged data product. Range changes occur at different times on the two instruments so the gains checked each periapsis can be determined. The Digital Fluxgate Magnetometer (DFG) uses an Electron Drift Instrument (EDI) to determine the zero levels along the rotation axis. Prior to launch the magnetometers were calibrated at the Technical University, Braunschweig, Germany. The Digital Fluxgate Magnetometer (DFG) is operated at 128 samples per second (inside the Region of Interest (ROI)). Within the ROI, burst mode data is acquired. A detailed description of the instrument can be found at <http://link.springer.com/10.1007/s11214-014-0057-3>. Additional information can also be found at <http://www.iwf.oaw.ac.at/de/forschung/erdnaehar-weltraum/mms/dfg> (IWF, Graz). For the purpose of creating a unified FGM Level 2 data product, burst mode data is taken from DFG and survey mode data is taken from AFG. Because AFG and DFG are cross-calibrated on an orbit-averaged basis, small differences in offset may be observed between Level 2 burst and survey mode data. Consequently, any differences are within the error of the measurement. Based on preliminary analysis of the data, the absolute error within the Region of Interest (ROI) is estimated to be no more than 0.1 nT in the spin-plane, 0.15 nT along the spin-axis and 0.2 nT in total magnitude.

Resource reference with DOI

Access Date

Reference should include Access Date, which when compared with RevisionHistory will indicate the version of the resource being referenced

**Details**

**NumericalData**

**ResourceID**  
spase://NASA/NumericalData/MMS/1/FIELDS/FGM/Burst/Level2/PT0.0078125S

**ResourceHeader**

**ResourceName**  
MMS 1 Flux Gate Magnetometer (FGM) DC Magnetic Field, Level 2 (L2), Burst Mode, 128 Sample/s, v4/5 Data

**AlternateName**  
MMS1\_FGM\_BRST\_L2

**DOI**  
<https://doi.org/10.48322/pj0n-m695>

**ReleaseDate**  
2023-03-04 12:34:56.789

**RevisionHistory**

**RevisionEvent**

**ReleaseDate**  
2021-04-27 15:38:11

**Note**  
Only known prior ReleaseDate of the metadata

**RevisionEvent**

**ReleaseDate**  
2022-08-04 12:34:56.790

**Note**  
Added DOI and PublicationInfo minted by LFB, updated the RepositoryID, updated the SPDF MetadataContact Person to Robert M. Candey, metadata updated to SPASE 2.4.1, reviewed by LFB 20220803

**RevisionEvent**

**ReleaseDate**  
2023-03-04 12:34:56.789

**Note**  
Standardized the ResourceName Format, Set AlternateName equal to the ProductKey, Revised the Acknowledgement, PublicationInfo Authors, and Contact Person list per request of the MMS FGM team, metadata updated to SPASE 2.5.0, reviewed by LFB 20230304

**Description**

RevisionHistory

# Near-Term and Long-term Development

Short-term (SPASE Group approval is imminent/straightforward)

- Incorporation of CSA CLUSTER keywords
- Addition Licensing info & RegistryID (*e.g.*, ROR IDs)
- Standardized unit representations (SI, VOUnits, etc.)
- First draft of SPASE primer/best practice document

Longer-term discussions

- Coordination/incorporation of metadata systems (ISTP, SOLARNET, PITHIA, OSCAR, etc.) into SPASE;
- Querying data based on Phenomena, through publications and authors
- Effective description of community-produced products (*e.g.*, AI/ML artifacts) to support their archiving, finding and reuse;
- Coordination/collaboration of SPASE metadata with access protocols (*e.g.*, HAPI, TAP, EPN-TAP) and tools (PyHC).
- **Broad adoption of SPASE by the Heliophysics community (international; space- and ground-based, modeling) and beyond**



# SPASE Coming Attractions...(2.7.0)

- SPASE “best practice” guide – A primer on how to make SPASE documents
- Addition of resource licensing information (e.g., *LicenseIdentifier*) under *AccessInformation*
- Addition of *RegistryID* references (e.g., *RORIdentifier*) in pertinent resource descriptions, such as Repository, Affiliations in Person
- More complete guidance on *ResourceID* formation for different SPASE *ResourceTypes* ([Resource ID Formation Rule](#) document to be updated)
  - Person: `spase://SMWG/Person/GivenName.[MiddleName. or MI.]FamilyName`
  - Observatory: `spase://NamingAuthority/Project/Observatory/ObservatoryName`
  - Instrument: `spase://NASA/Instrument/Observatory/InstrumentName`
  - Repository: `spase://NamingAuthority/Repository/RepositoryName`
  - NumericalData: `spase://NASA/NumericalData/Project/Observatory/Instrument/ProductName/Cadence`
  - DisplayData: `spase://NASA/DisplayData/Project/Observatory/Instrument/ProductName/Cadence`
  - Catalog: `spase://NamingAuthority/Catalog/[Observatory]/[Instrument]/ResourceName` or `spase://NamingAuthority/Catalog/ResourceName`
  - Collection: `spase://NamingAuthority/Collection/ProjectAObservatoryBInstrumentC_ProjectIObservatoryJInstrumentK`
  - Model: `spase://NamingAuthority/Model/ModelProvider/ModelName`
  - Annotation: `spase://NamingAuthority/Annotation/AnnotationType/**ResourceName`  
AnnotationType: Anomaly, Event, Feature, Phenomenon
  - Document: `spase://NamingAuthority/Document/Project/DocumentProvider/DocumentName/`
  - ModelRun: `spase://NamingAuthority/ModelRun/ModelRunProvider/ResourceName = model run name+date of model execution`
  - NumericalModelOutput: `spase://NamingAuthority/NumericalModelOutput/`
  - DisplayModelOutput: `spase://NamingAuthority/DisplayModelOutput/`
  - Registry: `spase://NamingAuthority/Registry/RegistryName`
  - Community-produced products: `spase://NameAuthority/ResourceType/CommunityProduct/ResourceProvider (e.g., PI)/ResourceName`
  - Service: `spase://NamingAuthority/Service/ServiceProvider/ServiceType/ResourceName`
  - Software: `spase://NamingAuthority/Software/SoftwareProvider/SoftwareType/ResourceName` (Example SoftwareType:SourceCode/Executable/...)
  - Granule: not commonly used anymore