

# Enhancements to the SPASE Metadata Standard: Simulations and Tools

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## HPDE

Heliophysics Data Environment (HPDE)  
 ... a place for scientific discovery.

- Based on the principals of
- Open Source
  - Open Systems
  - Open Data

Because most projects that acquire data are publicly funded and research is increasingly multi-domain. Our goal is to ...  
 ... enable sharing and collaboration in space physics research.

## SPASE

Space Physics Archive Search and Extract (SPASE) is an international, community-based standards organization with the goals of:

- Easing data search and retrieval across the Space and Solar Physics data environment
- Defining and maintaining a Metadata Model for Space and Solar Physics interoperability

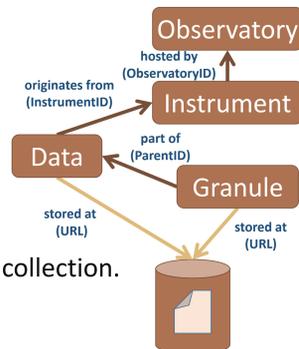
Organized in 2003 as an international consortium with an open invitation for anyone in the community to participate.

<http://spase-group.org>

Used or adapted by the international community and by other U.S. agencies (NOAA).

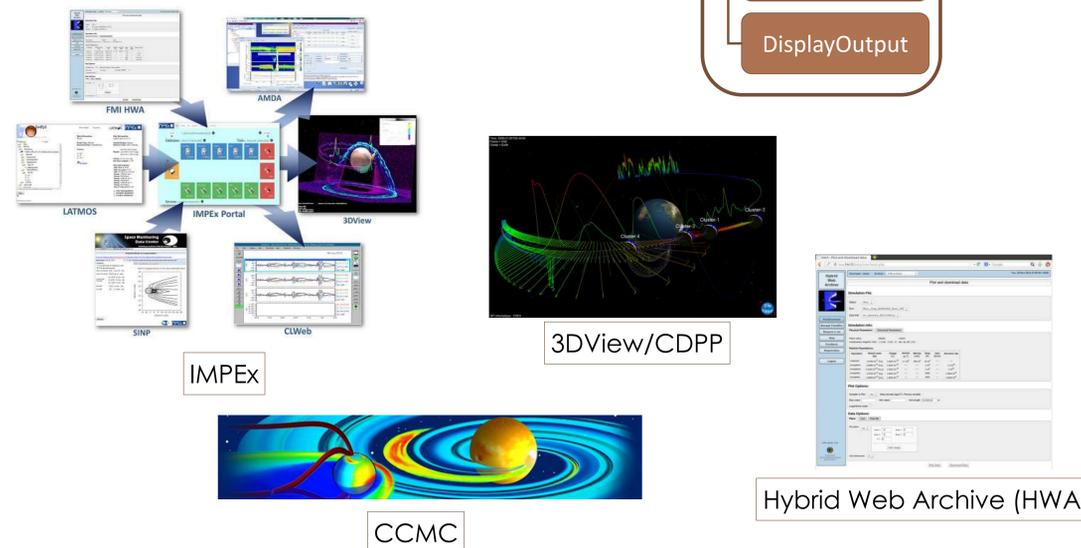
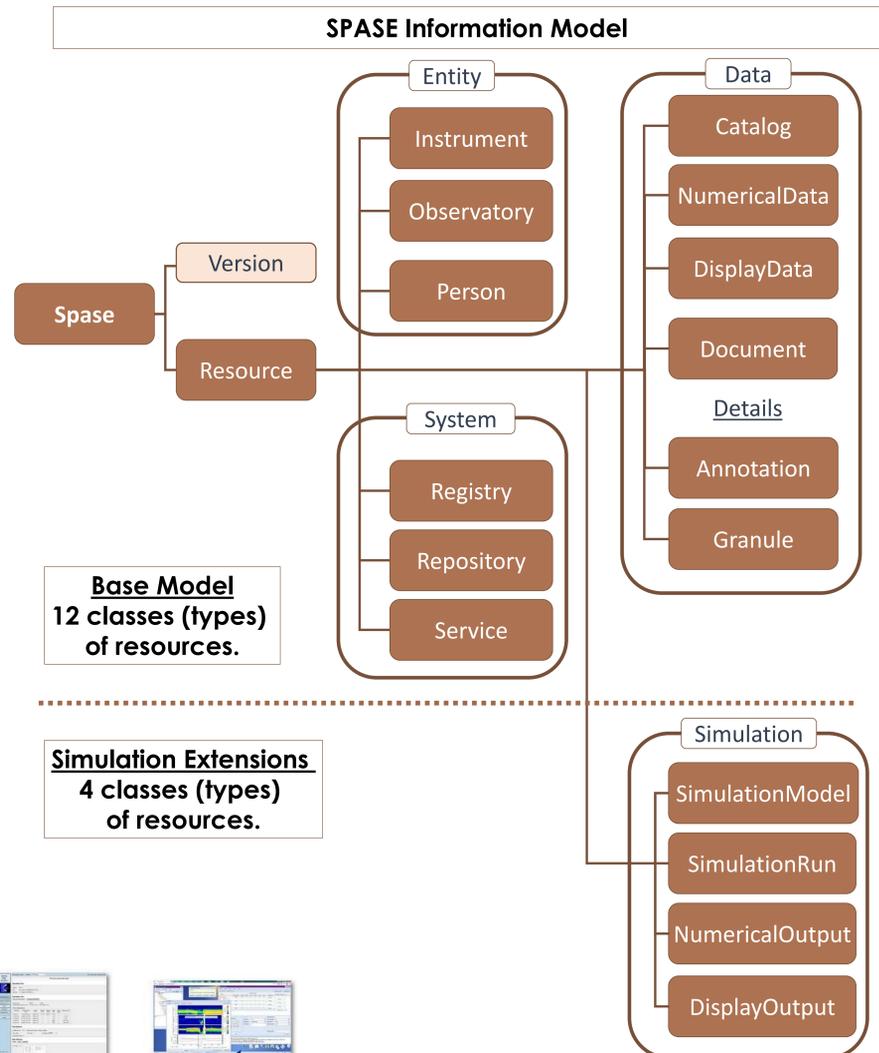
## Modular Metadata

- Describe each unique resource once.
  - Assign a universally unique identifier
- Then use associations to provide
  - Provenance, scientific context and location of sampled data.
- Like kinds of data are described as collections of files.
  - A "Granule" describes a member (file) of a collection.
- Metadata is connected to data through URLs.



Public Registries:

<http://github.com/hpde>



## Simulation Extensions

A set of extensions for describing simulation models, runs and the resulting data (numerical or display) have been endorsed by the SPASE consortium. The SPASE Simulation Extensions were originally developed by the Integrated Medium for Planetary Exploration (IMPEX) project, a European Union (EU) Seventh Framework Programme sponsored project.

## Resources

**SimulationModel:** Description of a simulation model that includes type of numerical scheme, versions, spatial application, input parameters and output parameters.

**SimulationRun:** Description of a simulation run, including the code ID, the run spatial and temporal description, and all the relevant inputs.

**NumericalOutput:** Numerical values created by a simulation run and stored in a specified format.

**DisplayOutput:** A graphical representation of data created by a simulation run wherein the underlying numeric values are not (readily) accessible for analysis. Examples are line plots and spectrograms.

## Tools

**Integrated Medium for Planetary Exploration (IMPEX):** An infrastructure to bridge the gap between observational data bases and scientific modelling tools, enabling their joint interconnected operation for the better understanding of related physical phenomena. <http://impex-fp7.oeaw.ac.at/>

**3DView/CDPP:** A science tool that offers immediate 3D visualization of spacecraft position and attitude, planetary ephemerides, as well as scientific data representation (observations and models). <http://3dview.cdpp.eu/>

**Hybrid Web Archive (HWA):** Numerical model platform for global hybrid simulations of planetary plasma interactions. <http://hwa.fmi.fi/>

**Community Coordinated Modeling Center:** a multi-agency partnership to enable, support and perform the research and development for next-generation space science and space weather models. <http://ccmc.gsfc.nasa.gov/>

## Summary

The simulation extensions are currently at version 1.0.0. We are working on some enhancements to capture more characteristics of the simulation models and runs.