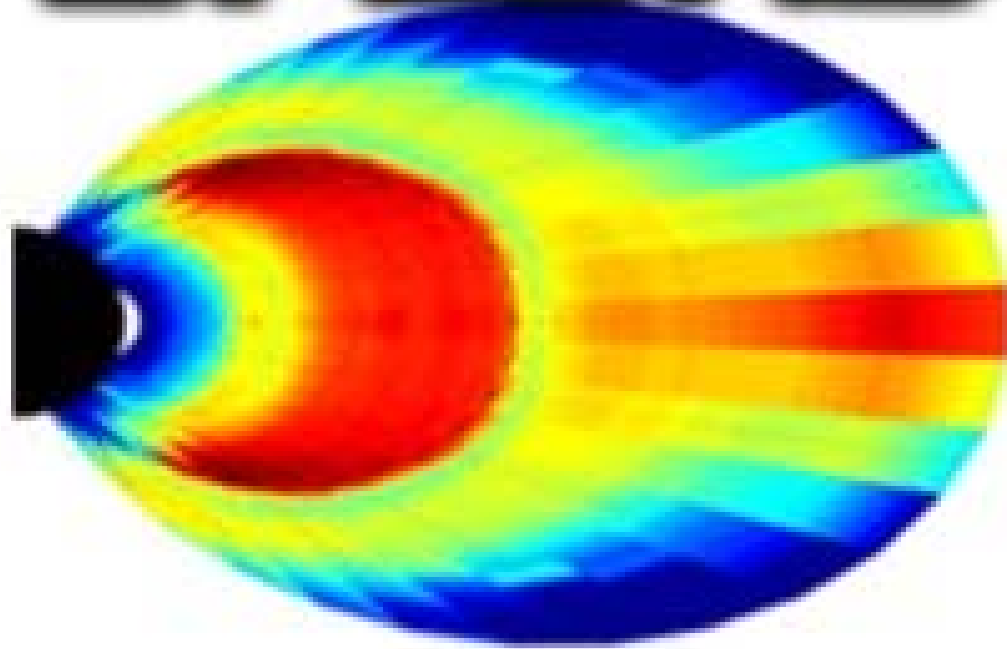




SPEEDAS



SPEEDAS and pySPEEDAS

THEMIS/ARTEMIS SWT meeting, Dec 14, 2019, San Francisco CA



Current state of SPEDAS/IDL development

- SPEDAS 3.2 was released in November 2019
- Updated plugin to support ICON mission (FUV, EUV, MIGHTI instruments; still under active development)
- ERG/Arase plugin updated with support for recently released L2 data products, ISEE tool for visualizing 3-d particle distributions
- Load routines for Parker Solar Probe (SWEAP and FIELDS data publicly available for first two encounters)
- Many updates to MMS plugin
- New `spd_flipbookify` tool for generating series of plots from 2-d slices over a time range
- GUI panel for Minimum Directional Derivative and Spatial Temporal Derivative (MDD/STD)
- Improved ability to import/export data between SPEDAS and Autoplot



SPEDAS Wiki



Introduction:

- You Tube Channel
- SPEDAS video
- Introductory Examples
- Screen shots

The screenshot shows a web browser window displaying the SPEDAS Wiki main page. The browser's address bar shows the URL `spedas.org/wiki/index.php?title=Main_Page`. The page has a navigation sidebar on the left with links like 'Main page', 'Community portal', and 'Recent changes'. The main content area includes a 'Main Page' heading, a 'Contents' table of contents, a 'Welcome to SPEDAS' section with introductory text, and an 'Introduction' section with a list of links to resources like the YouTube channel and installation video.

spedas.org/wiki



SPEDAS Downloads



Select:
1.2 Downloads
From Main
Page

The screenshot shows a web browser window displaying the SPEDAS Wiki page for Downloads. The browser's address bar shows the URL `spedas.org/wiki/index.php?title=Downloads`. The page content includes:

- Version 1.00, August 2014**
 - Source code.** This is a zip file with all the SPEDAS IDL source code. To use it you need to have IDL installed. This is the only distribution that provides full access to the command line tools. If you have used TDAS in the past, this is probably the option you should use.
 - [* Download SPEDAS 1.00 source code \(13 MB\)](#)
 - Save file.** This is suitable for users without an IDL license. It requires the IDL Virtual Machine (VM) which has to be downloaded for free from Exelis. There are limitations using the VM compared to the full IDL. This distribution only provides access to the GUI, and not the command line tools.
 - [* Download the SPEDAS 1.00 savefile \(14 MB\)](#)
 - Executable files.** These zip files contain executable files that can be run directly without installing anything else. They include a Virtual Machine (VM) version of IDL and they open the SPEDAS GUI but they do not include a command line tool, nor the SPEDAS IDL source code. They also include Geopack. (Note: If you have downloaded a zip file before Dec 5th, 2014, then you should download it again. The new version contains small fixes.)
 - IDL 8.3**
 - [* Download SPEDAS 1.0 Executable, Windows 64bit, IDL 8.3, Geopack 9.3 \(52 MB\)](#)
 - [* Download SPEDAS 1.0 Executable, MacOS 64bit, IDL 8.3, Geopack 9.3 \(60 MB\)](#)
 - [* Download SPEDAS 1.0 Executable, Linux 64bit, IDL 8.3, Geopack 9.3 \(70 MB\)](#)
 - [* Download SPEDAS 1.0 Executable, Linux 64bit, IDL 8.3, Geopack 7.6 \(70 MB\)](#)
 - IDL 7.1**
 - [* Download SPEDAS 1.0 Executable, Windows 64bit, IDL 7.1, Geopack 9.3 \(34 MB\)](#)
 - [* Download SPEDAS 1.0 Executable, MacOS 64bit, IDL 7.1, Geopack 9.3 \(48 MB\)](#)
 - [* Download SPEDAS 1.0 Executable, Linux 64bit, IDL 7.1, Geopack 9.3 \(53 MB\)](#)
 - [* Download SPEDAS 1.0 Executable, Linux 64bit, IDL 7.1, Geopack 7.6 \(53 MB\)](#)

The Enhancement Lists for SPEDAS Version 1.00 can be found [here](#).

Installation on a Mac
Newer Mac OS X versions do not include the Y11 libraries. YQuads (Y11) has to be downloaded and installed, or IDL will not work.

At the bottom of the browser window, there is a notification: "Firefox automatically sends some data to Mozilla so that we can improve your experience." and a "Choose What I Share" button.

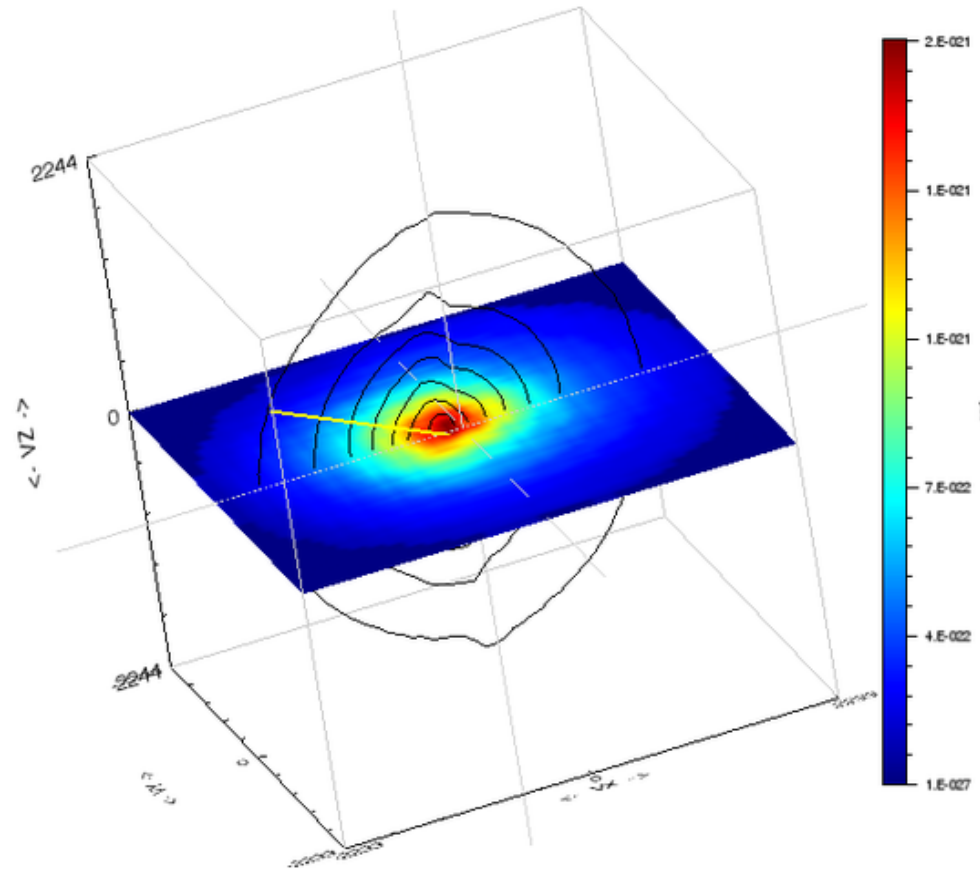
spedas.org/wiki/index.php?title=Downloads



ISEE 3D: MMS FPI ion contours



2015-08-15/12:50:03.923 - 12:50:57.923 (velocity)





Parker Solar Probe FIELDS data



```
; Large radio burst observed during Encounter 2

timespan, '2019-04-02'

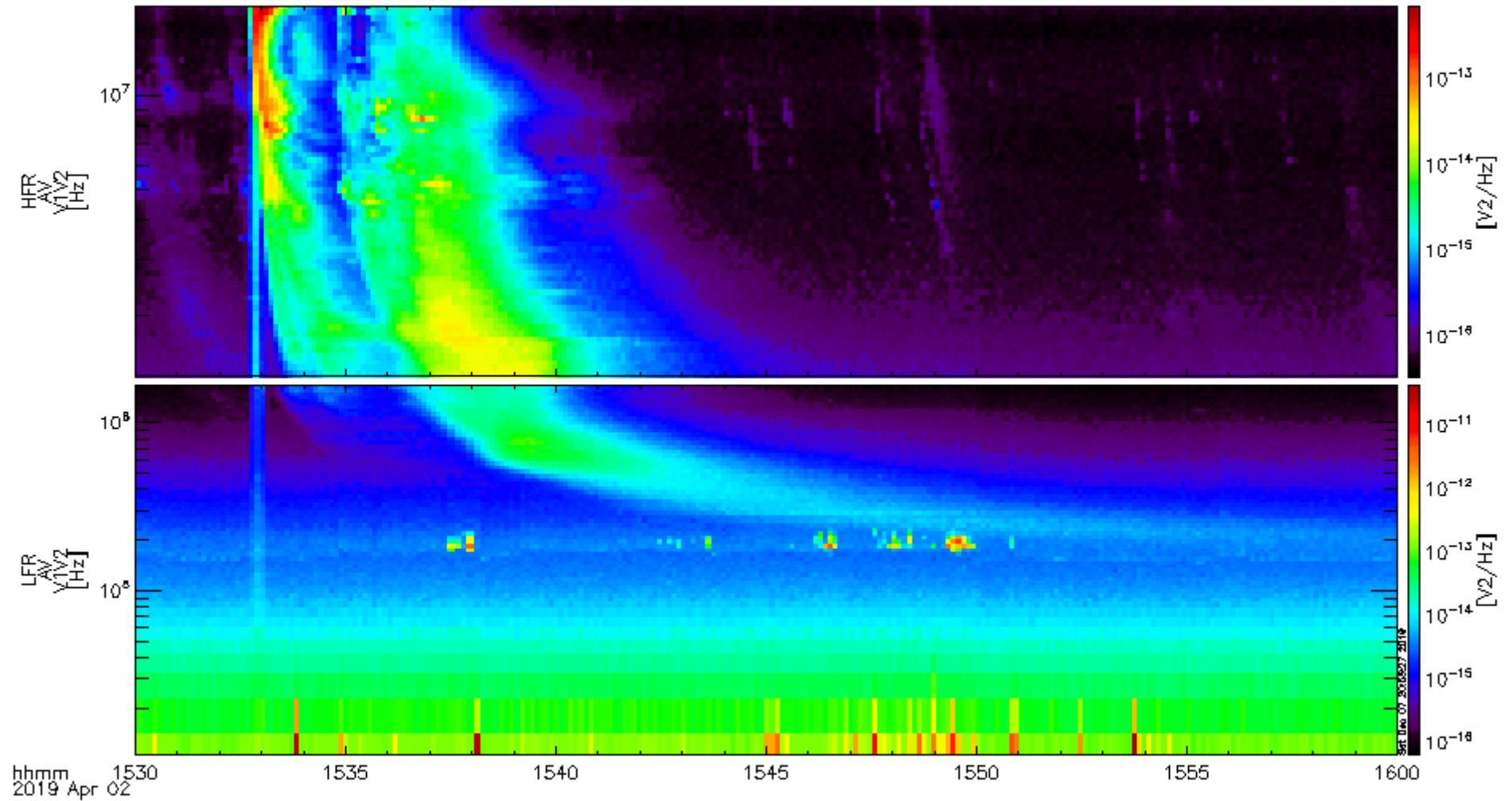
psp_fld_load, type = 'rfs_hfr'
psp_fld_load, type = 'rfs_lfr'

tplot, ['psp_fld_l2_rfs_hfr_auto_averages_ch0_V1V2', $
        'psp_fld_l2_rfs_lfr_auto_averages_ch0_V1V2']

tlimit, ['2019-04-02/15:30:00', '2019-04-02/16:00:00']
```



IDL 0





Loading CDAWeb Data



To Load CDAWeb Data:

- Select 'Load Data using CDAWeb' under the File menu
- Select Mission Group (i.e., TWINS, Cluster, RBSP, etc.)
- Select the Instrument Type
- Click 'Find Datasets'
- Select variable or dataset to download
- Click 'Get CDAWeb Data'



The screenshot shows the 'CDAWeb Data Chooser' window. The 'Dataview Selection' dropdown is set to 'CDAWeb (Space Physics Public Data)'. The 'Dataset Selection' section has two columns: 'Mission Groups' and 'Instrument Types'. Under 'Mission Groups', 'Van Allen Probes (RBSP)' is selected. Under 'Instrument Types', 'Magnetic Fields (space)' is selected. A 'Find Datasets' button is located below these columns. The 'Data Selection: Datasets/Variables' section shows a tree view of datasets, with 'RBSP-A-RBSPICE_LEV-3_ESRLEHT: 2012/11/13 22:06:46 - 2014/08/15 23:59:59: Low-energy hi' selected. At the bottom, there are input fields for 'Start Time' (2014-07-23/00:00:00) and 'Stop Time' (2014-07-24/00:00:00), a 'Local CDF directory' field (c:\data\cdaweb\), and a 'Use Single Day' checkbox which is checked. A 'Get CDAWeb Data' button is at the bottom center, and a 'Close' button is at the bottom right. A status bar at the very bottom shows '(2014-11-25/09:36:06) 9: Valid Start Time Entered'.



SPEDAS and HAPI



HAPI: Heliophysics Application Program Interface

- HAPI is a protocol for querying remote catalogs, locating data sets of interest, and retrieving data and metadata matching user requests.
- HAPI is intended to promote interoperability between different data providers, clients, and platforms
- SPEDAS includes command-line and GUI methods for browsing HAPI servers, retrieving data, and loading the results in TPLLOT or GUI variables for visualization and analysis

From SPEDAS to pyspedas

Main objectives of pyspedas:

- Develop python-based software similar to the IDL-based SPEDAS.
- Provide a significant subset of the current SPEDAS functionality: automatic downloads and local cache management of data files from remote sources; analysis and plotting tools for space-based and ground-based field, particle, and image data; interface to magnetic field models; rich set of geophysical, geomagnetic, field-aligned, and mission-specific coordinate transformations
- Implement python functions with names and workflows similar to SPEDAS tools (but implemented in a Pythonic way, rather than simply rewriting IDL code in Python)
- Load, analyze and plot data from multiple sources in a common environment
- Easy to install and use.
- Leverage other existing python projects where appropriate, without duplicating their code (examples: cdflib, pyplot), and make SPEDAS code available for easy reuse in other Python-based tools
- Ease learning curve by publishing useful, heavily annotated examples as Jupyter notebooks or other appropriate formats

Current state of pyspedas development

- Currently early beta version.
- Can be easily installed using “pip install pyspedas”.
- Source repository:
<https://github.com/nickssl/pyspedas>
- Implements functions to load Themis and GMAG data.
- Implements some of analysis function in SPEDAS (time_clip, tclip, tintepol, subtract_average, etc).
- Requirements:
 - Python 3, Anaconda (optional, recommended).
- Dependencies:
 - Cdflib (CDF file reader), developed by Michael Liu and Bryan Harter,
<https://github.com/MAVENSDC/cdflib>
 - Pytplot (Data object, similar to SPEDAS tplot object), developed by Bryan Harter,
<https://github.com/MAVENSDC/PyTplot>

spedas / pyspedas

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SPEDAS routines for Python

space-physics

217 commits 1 branch 0 releases 3 contributors MIT

Branch: master New pull request Find File Clone or download

supervised going to version 0.8.3	Latest commit 47533d8 3 days ago
pyspedas	Big update to support pyTplot 1.4 (with xarray) 3 days ago
.gitattributes	Revert "Revert "Merge branch 'master' of https://github.com/spedas/py..." 5 months ago
.gitignore	Update .gitignore 5 months ago
.travis.yml	Update .travis.yml 4 months ago
.travisreqs.txt	temp fix for travis 4 months ago
LICENSE.txt	Initial 5 months ago

Future development roadmap

- Provide data loaders for other missions.
- Support other data formats (NetCDF, ASCII)
- Support interoperability with other Python packages, by adopting common conventions for data and metadata representations (times, units, data descriptions), and structuring pyspedas code with an eye toward future reuse and repurposing
- Integrate with HAPI and CDAWeb tools.
- Implement more SPEDAS data analysis functions.
- Integrate coordinate transformation functions from other heliophysics Python packages where available, or implement new code as needed
- Create a more stable release.
- Implement the recommendations of the “Heliophysics Python Community Standards Document”.
- Provide some examples as Jupyter Notebooks.